Vol. XIX. Part 5.

NATIONAL MUSEUM OF VICTORIA

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The Journal of the Department of Agriculture of Victoria, Australia.

May, 1921.

PRINCIPAL CONTENTS

Crop and Fallow Competitions, Dimboola and Goroke

Friesian Cattle in Victoria

Resistant Vine Stocks

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VICTORIA, AUSTRALIA.

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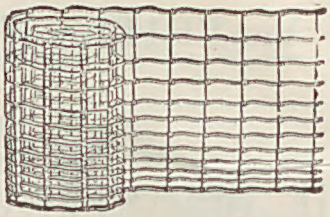

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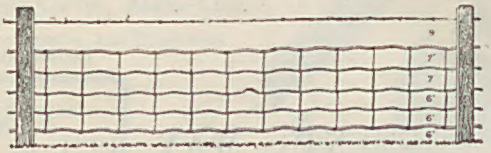

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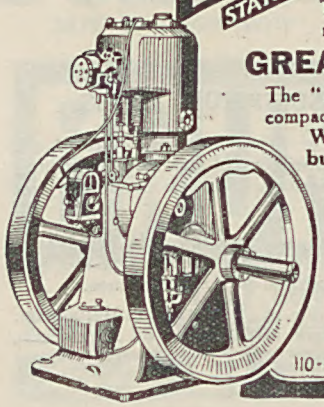

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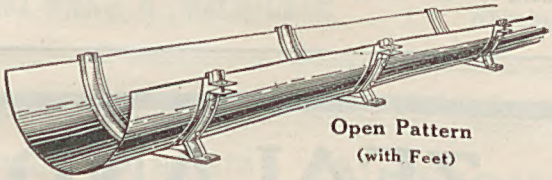

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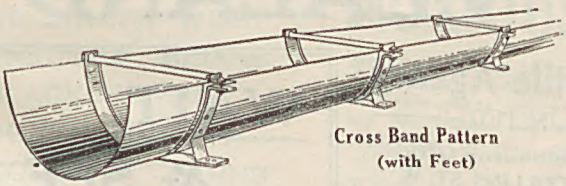

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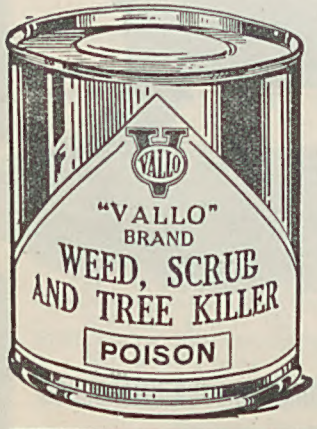

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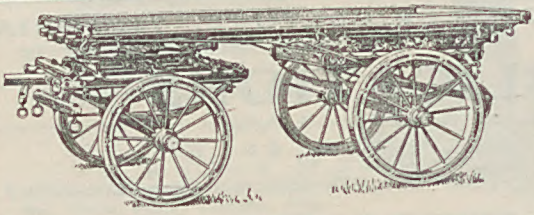

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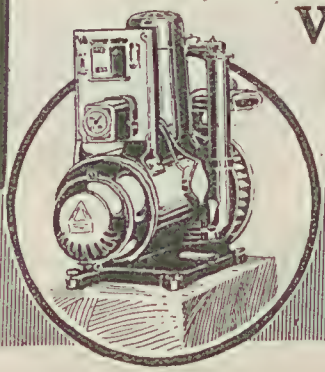

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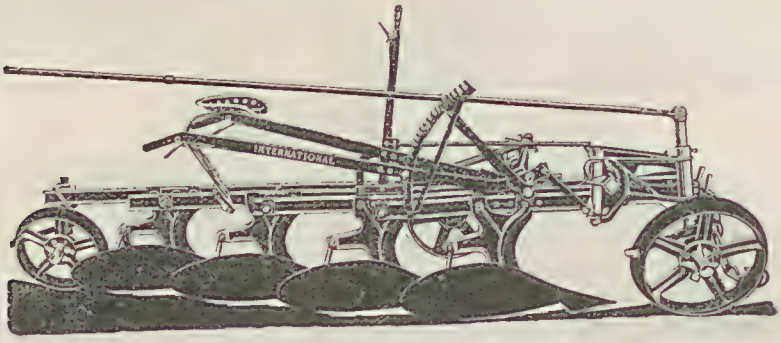

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DIMBOOLA CROP AND FALLOW COMPETITION, 1920.

Report of the Judge, H. A. Mullett, B.Ag. Sc., Chief Field Officer, Department of Agriculture.

THE DIMBOOLA DISTRICT.

Nowhere in the wheat belt is such a marked contrast in the fertility of soil types to be found as at Dimboola. There the barren white sands of the Little Desert meet the rich black soils of the Wimmera plains. The former are used only as a run for a few sheep in a dry season while the latter support a prosperous rural population.

There was a time when these rich soils, too, were but a run for roaming sheep, and supported merely a sparse population, but wheat-growing changed all that. To-day nowhere in the State is there better visible evidence of successful land settlement. Well-improved farms, comfortable homesteads, and prolific wheat crops relieve the monotony of the landscape which was once a bare plain.

At first the settlers grew wheat with difficulty, but they soon learned to fallow the land and to work the friable black soil to a tilth like a garden. Superphosphate was introduced, more prolific varieties of wheat were sown, profitable rotation systems discovered, and gradually a highly specialized type of agriculture evolved. But Dimboola farmers do not believe that they have yet reached perfection in wheat-growing. They know that some of their fellows have developed practices more profitable than others. That is why they hold these annual Crop and Fallow Competitions. They hope to discover the best crop and fallow in the district each year, and to learn, if possible, the reason for its success.

The Competition, 1920.

There were nineteen entries in all; these were distributed between eight sections with prizes for crops and fallows on both large and small

farms on Mallee soils, and further prizes for crops and fallows on both large and small farms on black land. Some of the sections were well contested, but in the Mallee sections the entries were so limited as to preclude competition.

RESULTS, CROPS.

Section 5.—Large Farms other than Mallee, 150 acres of Wheat.

The winner of this section was F. W. Sallman, with 94 points; T. Feery being second with 89. The winning crop was a 140-acre paddock of Federation wheat. It was exceptionally true to type, dense and level. It should yield heavily. The seed used was selected Federation, from Longerenong College. There were a few wild oats present.

A Heavy Crop of Federation.
Mr. F. W. Sallman, Dimboola. First Prize, Section 5.

The crop was grown on land which was ploughed to 4 inches deep in July and August. It was then harrowed and scarified at the end of September. After harvest it was harrowed in February. Subsequently, it was sown with a combined spring-tooth cultivator-drill, and then harrowed. Seventy pounds of seed and 90 lbs. of superphosphate were used to the acre.

Mr. T. M. Feery's crop of Federation consisted of two paddocks, one 85 acres, sown in May, and the other 65 acres, sown in the beginning of June. Contrary to the usual experience this year, the latter sown crop appeared to be the lightest. From 75 to 80 lbs. of seed was used and 90 lb. manure. Neither of these crops was so heavy as that of Mr. Sallman.

The land was ploughed in August to 3½ inches, harrowed twice, scarified in November, and harrowed again in March. Before drilling it was re-scarified, drilled, and harrowed. It will be noted that all the cultural operations given this crop were somewhat later than those of Mr. Sallman.

DETAILS—SECTION 5.

For Best 150 acres of Growing Wheat Crop on Land other than Mallee. Farm to be 640 acres or over.

Name.	Yield.*	Trueness to Type.	Absence of Disease.	Absence of Weeds.	Evenness.	Total.
Possible Points	**35**	**20**	**15**	**15**	**15**	**100**
F. W. Sallman	35	19	14	11	15	94
T. Feery	31	17	13	14	14	89
P. H. Muller	26	16	10	15	14	81

* The points allotted under this head do not represent bushels per acre, and the actual yields were larger.

Section 7.—Small Farms other than Mallee, 100 acres Wheat.

The winner in this section was G. Nettlebeck, with a total of 87 points. E. G. Nuske was second with 84. The winning crop was

A Prolific Crop—Federation.
Mr. T. Feery, Dimboola.

grown on red, loamy land, of which there are but small areas in the district. The crop consisted of 100 acres, comprising Red Russian, Federation, and a new variety of handsome appearance called Dollar. The crop was exceptionally free from weeds and fairly true to type, though some strangers were seen. It was notably even and level. The yield was not so high as some grown on the richer black soils, but still it was good.

This crop was grown on well-worked winter fallow, and sown in May, with 1½ bushels of seed and 1 cwt. of manure. No less than eight separate workings were given the fallow on which the crop was grown. It was ploughed in June and July from 4 to 4½ inches deep. Subsequently, it was harrowed, scarified in September, then harrowed and scarified again in October, harrowed and left till sowing time. It was then scarified up, harrowed and sown. The exceptionally good

yield obtained for the class of soil is probably in no small measure due to the careful treatment given the fallow.

Mr. Nuske's crop of Federation was grown on summer-fallowed land. On this block the sub-soil is close to the surface, so that Mr. Nuske, of necessity, is obliged to cultivate his land as shallowly as possible. The fallow on which the crop was grown was scarified in March and April to 3 inches deep. In August it was lightly ploughed, then harrowed twice in the spring. After harvest it was scarified and spring-tooth cultivated, harrowed, and drilled with a combined scarifier drill. Sixty-seven lbs. of seed and 60 lbs. manure were used. Mr. Nuske lost marks because of the presence of foreign heads in his crop.

DETAILS—SECTION 7.

For Best 100 Acres of Growing Crop of Wheat on Land other than Mallee. Farm to be less than 640 acres.

Name.	Yield.	Trueness to Type.	Absence of Disease.	Absence of Weeds.	Evenness.	Total.
Possible Points	**35**	**20**	**15**	**15**	**15**	**100**
G. Nettlebeck	28	17	12	15	15	87
E. G. Nuske	29	16	13	11	15	84
T. F. Schwartz	32	19	8	12	12	83
H. Budde	31	14	8	14	15	82
A. A. Moller	26	15	11	14	11	77

Section 1.—150 Acres Wheat: Large Mallee Farm.

Mr. E. Schaefer was the only competitor in this section, and therefore the winner. Red Russian, Penny, and Federation were the varieties shown. The crop was a creditable one. It was fairly true to type and free from weeds and wild oats. It was sown in May, with 70 lb. of seed and 100 lbs. of superphosphate. The fallow on which the crop was grown was well worked; it was ploughed in July to 3 inches deep, then harrowed, scarified in September, scarified again in October, harrowed and left for the summer. It was re-scarified again in March, and also again in May, just prior to drilling.

DETAILS—SECTION 1.

Name.	Yield.	Trueness to Type.	Absence of Disease.	Absence of Weeds.	Evenness.	Total.
Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**
E. Schaefer	21	18	11	14	14	78

Section 3.—100 Acres Wheat: Small Mallee Farm.

Mr. J. Glatz was the only competitor, and therefore the winner in this section. This crop was grown on land which is liable to water-logging in a season like the past. The fallow was well worked and

the land liberally seeded and manured. The resultant crop was moderately good.

DETAILS—SECTION 3.

Name.	Yield.	Trueness to Type.	Absence of Disease.	Absence of Weeds.	Evenness.	Total.
Possible Points ..	35	20	15	15	15	100
G. J. Glatz	15	18	12	15	12	72

RESULTS: FALLOWS.

Section 8.—100 Acres Fallowed Land on Small Farms other than Mallee.

The winning entry in this section was a paddock of summer fallow, shown by H. Budde. It was awarded 96 marks. This fallow had a fine mellow dust mulch overlying a damp, firm seed bed. The same high moisture content and thorough consolidation was not observed in any of the other exhibits that had been winter-fallowed. This paddock was ploughed lightly in February and March, then harrowed twice. In July it was re-ploughed, harrowed twice in August, scarified in September, then harrowed, spring-tooth cultivated in October, and finally harrowed twice more.

E. G. Nuske was second with 93 points. His paddock was winter-fallowed early, *i.e.*, in May-July. It was harrowed twice, scarified early in September and again harrowed. The surface of the soil had that mellow appearance which experience has shown to be indicative of a high condition of fertility in black, Wimmera soils. The consolidation was good. It will be noted that the various cultural operations had been effected earlier than is usual in the district for winter fallow.

Mr. J. Thompson also showed a creditable piece of fallow. The remaining exhibits, though of fair tilth and appearance, lacked consolidation in the under layers.

DETAILS—SECTION 8.

For Best 100 Acres of Fallow on Land other than Mallee Land. Exhibited by Farmers Owning Land not over 640 Acres.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	25	25	25	25	100
H. Budde	25	24	23	24	96
E. G. Nuske	24	24	22	23	93
J. Thompson	24	21	24	23	92
G. Nettlebeck	23	22	25	22	92
W. G. Harders	21	23	22	23	89
A. A. Moller	21	20	24	20	85

Results, Section 6.—For best 150 acres Fallow on Large Farm other than Mallee.

Mr. P. H. Muller was the first in this section, there being only one competitor. His paddock was in grass last year, and some difficulty had been experienced in bringing it into a satisfactory condition of tilth.

DETAILS—SECTION 6.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total
Possible points	**25**	**25**	**25**	**25**	**100**
P. H. Muller	22	20	19	20	81

Section 4.—For best 100 Acres of Fallow on Mallee Land, exhibited by Farmer owning 640 Acres of Land or less.

There was only one competitor in this section—Mr. G. J. Glatz—who is therefore the winner.

This fallow was in a somewhat unsatisfactory state of tilth. It was ploughed in July, and then some time elapsed before it was harrowed. Consequently, it set on top, and difficulty was experienced in working it down.

DETAILS—SECTION 4.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
G. J. Glatz	21	16	20	14	73

Section 2.—For best 150 Acres of Fallow on Mallee Land by Farmer owning 640 Acres of Land or over.

Mr. E. Schaefer was the only competitor in this section, and is therefore the winner.

The fallow was not in the best possible condition. It was ploughed in July, then harrowed twice. Subsequently, it was scarified in August, then harrowed, and a portion spring-toothed during September and October.

DETAILS—SECTION 2.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
E. Schaefer	18	18	23	19	78

SUMMARISING THE RESULTS.

Crops: Improved Pickling Methods Necessary.

Dimboola farmers have good reason to feel satisfied with the general result of their farming operations, which, in many cases, have been sufficiently successful to render them more than prosperous; but there are several directions in which a step forward may be readily made. One of them was mentioned in last year's report.

The necessity for increased attention to the elimination of ball smut from the wheat crops is what is referred to. It is surely unsatisfactory that not a single crop in the competition was entirely free from ball smut. Yet that was the case, and it is a distinction which is unique among seven Wimmera districts in which competitions took place during the present season. True, in no case was the trouble very serious, but one would be justified in inferring that there were other crops in the district more seriously affected than any of those entered for competition.

Economical Method of Adding Height to Tank.
(Mr. H. Budde, Dimboola.)

Seeing that with the use of certain special methods ball smut can be entirely eliminated from the wheat crop, it is reasonable to suppose that there is something radically wrong with the method of pickling that is generally adopted locally. This is one in which a certain allowance of bluestone is made for each bag of wheat pickled, without due regard for the amount of water used, or length of time the pickle is in contact with the wheat. These factors are each of fundamental importance. A fertile source of infection is the failure to take systematic precautions to remove all smut balls from the seed. Seed known to be smutted should, of course, not be used.

There is only one method which has proved uniformly successful in the prevention of smut. The pickle must be weighed, the water measured, the time of contact of the pickle and the grain must be

definite, and provision made for the removal of any stray smut balls. The standard strength for pickling is, bluestone 1½ lbs., dissolved in 10 gallons of water, or formalin 1 lb., dissolved in 45 gallons of water. The seed should be poured into the pickle, and any scum or smut balls which float after stirring should be removed. The immersion of the

A Fine Wimmera Homestead.
(Mr. F. W. Sallman, Dimboola.)

Modern Farm Residence erected by Mr. T. Feery, Dimboola.

grain should be for not less than three minutes and not longer than four minutes.

There are several types of pickling machines which do the work satisfactorily, but there are other sorts not so effective. In the absence of a good pickling machine, each bag should be broken into two or three

butts, and these dipped while open, and after vigorous rinsing, skimmed of rubbish while still submerged in the pickle. Other methods such as the use of the "grain box" may appear to give satisfactory results until put to a real test.

Smut is a disease which works up to a maximum insidiously. It increases gradually from year to year until a favorable season for its development. Then it makes its appearance severely felt.

Quantity of Seed and Manure.

The usual method of sowing wheat at Dimboola is to drill the paddock "round and round." That generally leads to the double sowing of two strips running diagonally across the corners. It is a significant fact that in practically every crop inspected on the black

Pedigree Brood Mares and Foals.
(Mr. F. W. Sallman, Dimboola.)

land, considerably heavier and thicker crop was noticed on these strips.

Strips in the crops of Messrs. Budde, Schwartz, and Nuske are cases in point. All these crops were sown with approximately a bushel of wheat to the acre and 60 to 80 lbs. of superphosphate. One cannot resist the belief that the heavier yield on these double-sown parts points to considerable advantages to be derived from the use of increased quantities of seed and manure at Dimboola, especially on land which is well worked, as are these diagonal strips.

That, at any rate, is the lesson the results of the experimental plots at Longerenong College teach. They show that, on the average, 75 lbs. of wheat per acre, sown in July, will yield an increased return of 2 bushels of wheat per acre, as compared with the yield when 60 lbs. are used. Similarly, the use of increased quantities of manure, within limits, is highly profitable. Dimboola farmers would, therefore, probably find that increased dressings of seed up to from 75 to 80 lbs., and heavier dressings of manure, up to 1 cwt. per acre, would be most remunerative.

Fallowing.

The value of fallowing the land early has long been recognised in the Wimmera. More recently have the benefits of the June and July sowing become known. Late sowing is now the standard practice on all black land at Dimboola, and rightly so. But early fallowing and late sowing on most farms are mutually antagonistic. July sowing means fallowing delayed to August, and even September. September-fallowed land can rarely be sufficiently consolidated. It does not grow the best crops.

This difficulty has induced farmers in many Wimmera districts to summer fallow portion of their land. That is to say, they plough or scarify some of the fallow before cropping time, often as early as February, and sometimes as late as April. But the practice is not extensively followed at Dimboola; yet it is one that might be adopted with profit.

There is no doubt that the yield of wheat will be increased as a result, for that is the experience elsewhere. The increase is reckoned at from one to two bags to the acre.

Other important advantages are the better distribution of the farm labour over the year, and the readiness with which the land can be cleansed of weeds. Subsequent to the first ploughing or scarifying, which should be shallow, the paddock is worked as an ordinary fallow. In a dry year never plough the paddock twice; in a wet year do not let the weeds get too far ahead before killing them.

In conclusion, I have to thank the Secretary, Mr. C. Bennett, and the Judging Stewards for their assistance during the competition.

GOROKE CROP AND FALLOW COMPETITION, SEASON 1920.

Report by the Judge, Mr. I. M. Tulloh, Field Officer, Longerenong College.

Two distinct classes of soil are met with in the Goroke District—the heavy and the light.

The heavy soil, if brought into proper condition, is capable of returning a high yield of wheat per acre; while the light soil, requiring less cultivation, returns a lighter yield, and gives a better result with a moderate rainfall.

In many instances sheep raising still receives first consideration, and much of the cropping is done on the share system, the owner having in view the resultant benefit to the pasture more than the actual share of the crop. On such farms fresh land is being continually broken up. The new black soil is invariably rough and crabholey, and much difficulty is experienced in working it, while the yields are frequently reduced by water lying on the low patches during winter and early spring.

In the past the share-farmer fallowed the land, and worked elsewhere for wages—frequently out of the district—until sowing time, and during his absence the fallow received little or no attention. This also applied to the farmer with a small holding. As the ground was new little trouble occurred from weeds, and in a favorable season fair yields were obtained.

Now, however, wheat-growing is the chief consideration, and consequently better methods are practised, and more consistent yields from year to year obtained; but in many instances the land has not been brought into that condition, nor have the cultural methods been applied by which the maximum return from the wheat crop could be obtained. Hence the inauguration by the Goroke Society of these Competitions, of which four have now been held, should prove of immense value to the district. They are also most opportune in view of the fact that many allotments in the district have recently been taken up by returned soldiers, who, if they are to succeed, will have to obtain better and more consistent wheat yields than those indicated by the district averages in the past.

The competition this season was divided into four sections.

HEAVY SOILS.

Section 1.—Aggregate of points for last season's fallow and this season's crop of 50 acres.

Section 2.—Best 50 acres of crop.

LIGHT SOILS.

In Sections 3 and 4 the competition was for crops and fallows on light soils, with similar conditions as in Sections 1 and 2.

Section 1.

AGGREGATE OF POINTS FOR CROP AND FALLOW ON HEAVY SOIL.

There were eight competitors in this section last year, but three having since withdrawn, only five crops were judged.

	Variety.	Yield.	Purity of Type.	Freedom from Disease.	Freedom from Weeds	Evenness.	Crop Total.	Fallow, 1919-20.	Aggregate.
Maximum Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	—	—
N. Tully	Federation ..	26	18	13	14	12	**83**	**90**	**173**
T. Ough	Penny ..	33	16	8	13	14	**84**	**71**	**155**
A. J. Lees	Penny ..	22	17	6	9	7	**61**	**93**	**154**
E. Cross	Yandilla King ..	31	18	14	11	13	**87**	**63**	**150**
F. O. Robertson	Federation ..	32	11	14	13	12	**82**	**56**	**138**

As conservation of moisture is the primary object of fallowing, the heavy rainfall during the winter, and its frequent recurrence during the spring, to a great extent modified the usual difference between the results from good and bad fallow, and it will be noticed that in the points above some of the poorer fallows have grown heavy crops. This must not be taken as a test between good and indifferent cultural methods, for in all experiments conducted and in actual practice on the farm well worked fallow has invariably given a higher average yield over a number of seasons than neglected fallow, and in a dry season, has returned a payable crop when inferior fallow has yielded practically nothing.

Mr. Tully's crop of Federation was grown in a field which contained a sufficient proportion of black ground to necessitate its being classed as a heavy soil. He was rather unfortunate, however, in having a large area of red soil included. The crop on the black soil was heavy, but the average yield was considerably reduced by the lighter crop on the light soil.

The land was fallowed in July, scarified early in October, and harrowed a fortnight later. It was spring-toothed before sowing, which was made early in May, with 75 lbs. of seed and 1 cwt. of super. per acre, and harrowed after the drill. The crop was very free from disease and weeds, had headed well, and contained very few foreign varieties, and was in every way a very commendable crop.

Mr. Ough's crop was grown on a rich black flat, which had been ploughed in June, and disced at the end of November. It was harrowed before drilling with heavy harrows, and sown with 60 lbs. of seed and 100 lbs. of super., in the middle of May. This was a very heavy crop, very even, and moderately free from weeds. There was a fair number of foreign varieties present, and "stinking smut" was rather prevalent.

Mr. Lee's crop, which was grown on well prepared fallow, was unfortunately badly water-logged during winter and spring months, causing the crop to die out altogether in many places, and to be very thin in others. Where unaffected the crop was well grown and dense. "Stinking smut," however, was much in evidence.

The land had been ploughed late in August, and early in September scarified at the end of October, and "smoodged" during November. It was scarified before drilling late in May, when 90 lbs. of seed and 80 lbs. of super. and bone mixture per acre were sown.

Mr. Cross had a heavy crop of Yandilla King, which was very even, free from disease, and contained very few strangers. The land had been ploughed in June, spring-toothed in August, and harrowed in September. It was spring-toothed before the drill, and sown in the middle of May at the rate of 75 lbs. of seed and 100 lbs. of super. per acre. This crop, growing on a heavy black flat, was tall and dense, but was spoilt to some extent by a water-course in a portion of it.

Mr. Robertson's crop of Federation was growing on a black flat, which included, however, a large patch of limestone soil, on which the crop was lighter. The land had been ploughed in June, and left till sowing time, when it was put in with a Suntyne combination, at the latter end of May and early in June. Sixty pounds of seed and 100 lbs. of super. were sown per acre. The crop had grown nicely, and was fairly free from weeds and disease; but its appearance was greatly marred by the large number of foreign varieties present.

Section 2.

BEST 50 ACRES OF CROP ON HEAVY SOIL.

Four of the crops entered in the previous section were also entered in this section, and two others were included.

——	Variety.	Yield.	Purity of type.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Total.
Maximum Points ..	..	**35**	**20**	**15**	**15**	**15**	**100**
E. Cross	Yandilla King	31	18	14	11	13	**87**
T. Ough	Penny ..	33	16	8	13	14	**84**
F. O. Robertson ..	Federation ..	32	11	14	13	12	**82**
J. Molloy	Federation ..	27	15	6	10	9	**67**
F. Hinch	Federation ..	21	15	13	9	9	**67**
A. J. Lees	Penny ..	22	17	6	9	7	**61**

Mr. Molloy's crop of Federation was growing on a heavy, but rather crabholey, black flat. On the banks the crop was heavy, but the average yield was considerably lowered by the failure of the crop in the crabholes, some of which were very large, and had been water-logged early in the season. This, with the ravages of "take-all" and "stinking smut," had played havoc with what in the early stages must have appeared a promising crop. The land was ploughed in August, scarified in September, and then left till sowing time, when it was scarified in front of the drill, and followed by the harrows. Sixty lbs. of seed and 100 lbs. of super. were sown per acre. The crop was surrounded by a belt of Algerian oats, from three-quarters to one chain in width, as a precaution against grubs. Mr. Molloy finds that they will not penetrate any depth into a crop of Algerian oats. Mr. Hinch's crop was sown on a field which included several large patches of light soil. At first sight it appeared to be badly affected with "take all," but on examination this condition was found to be caused by limey patches—almost a marl"—on which the crop had grown thinly, and developed very poorly.

Along one edge of the crop Mr. Hinch had ploughed a strip about a chain wide, which had not previously been under cultivation. There was a striking contrast between the crop grown here and that in the remainder of the paddock, the former being denser, a little taller, and free from weeds.

The land had been fallowed late in July and early in August. It was disced late in March and early in April, and, with the harrow following the drill, was sown late in May with 75 lbs. of seed and 122 lbs. of super. per acre.

Section 3.

LIGHT SOILS.—FIFTY ACRES AGGREGATE OF POINTS FOR LAST SEASON'S FALLOW AND THIS SEASON'S CROP.

—	Variety.	Yield.	Purity of Type.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Crop Total.	Fallow.	Aggregate Points.
Maximum Points ..	.. ..	**35**	**20**	**15**	**15**	**15**	**100**	—	—
Caldow Bros. ..	College Purple Straw	20	19	13	15	14	**81**	**78**	**159**
J. Cummings ..	Federation ..	13	16	13	10	10	**62**	**60**	**122**
G. Richards	Federation ..	19	18	13	12	9	**71**	**39**	**110**

Messrs. Caldow Bros.' crop of College Purple straw was sown on gently sloping land, which had been ploughed in August and harrowed in February. It was spring-toothed before the drill, and 60 lbs. of seed and 1 cwt. of super. per acre were sown at the latter end of April and early in May. The resultant crop was remarkably even throughout, free from weeds, and true to type. In common with other crops on light soils, it had stooled sparsely, but had headed well, and was a very creditable crop.

Mr. Cumming's crop was sown on land dotted occasionally with timber, and had been fed well off with sheep in July. It included many

patches on which water had lain during the winter, where the crop had grown very poorly. Where better natural drainage occurred the crop had grown nicely and headed well. Ploughing had been done late in August, and the fallow then left till sowing time. It was spring-toothed before drilling, and then harrowed. Seventy-five pounds of seed and 1 cwt. of super. were sown per acre. The crop contained a fair number of foreign varieties, and weeds were also rather numerous.

Mr. Richards' crop was sown on a rather uneven paddock, and, like Mr. Cumming's crop, it had suffered from water-logging. The land was ploughed early in August, and spring-toothed in front of the drill, and was sown at the latter end of May at the rates of 75 lbs. of seed and 1 cwt. of super. per acre. The crop was fairly true to type, and contained a moderate number of weeds.

Light Soil.

Mr. Richards' crop was heavy on the banks, but was badly water-logged in many places.

Section 4.

Best 50 Acres of Crop on Light Soil.

There were four entries in this section—the three included in the previous one, and Mr. H. D. Walker.

—	Variety.	Yield.	Purity of type.	Freedom from disease.	Freedom from weeds.	Evenness.	Total.
Maximum Points ..	.. .. ..	35	20	15	15	15	100
Caldow Bros. ..	College Purple Straw	20	19	13	15	14	**81**
H. D. Walker ..	Federation ..	23	17	13	13	13	**79**
A. Richards ..	Federation ..	19	18	13	12	9	**71**
J. Cumming ..	Federation ..	13	16	13	10	10	**62**

Mr. Walker's crop was grown on sloping land, which had been ploughed in one chain lands during July and August. It was spring-toothed in March, and harrowed a week later. It was spring-toothed again before drilling, and harrowed after, and 75 lbs. of seed and 1 cwt. of super. were sown per acre. The crop was well headed, and, considering the light soil, had stooled well. It was fairly free from weeds, and few foreign varieties were present. Being ploughed in lands, fairly good drainage was provided, and the yield was thus considerably increased, as practically no water lay on the crop during the season.

Heavy Soils.

Although in normal seasons good crops on the heavy soils are frequently obtained, there is always a certain percentage of poor ones, and and wheat-growing is looked upon by many in the district as a rather uncertain venture.

The rainfall is similar, and in many cases better, than that in many good wheat-growing districts, while a similar comparison can be made

Trees are a great asset to the homestead.
A fine avenue leading up to Mr. Cross's house.

regarding the soils. Where the owner is having his land cropped on the share system with the view of improving the pasture, the issue is not so vital—at least to the owner, if not to the share farmer, but where allotments have been taken up which are too small to support enough sheep to provide a living income, the farmer has to stand or fall by his wheat yield, and it is here that consistent yields have to be obtained.

It is found that the biggest percentage of poor crops result from water-logging, and to avoid this little has been done in the past. The water-logging is due to two causes—

(*a*) Water-courses which in the wet season spread out over the field and ruin many acres.

(*b*) The crabholey nature of the ground on which water lies in the depressions all winter, and kill up to one-third of the crop.

In regard to the water-coures the spread of the water could be greatly limited and removed from the crop rapidly, by the making of suitable drains. With a single-furrow plough and a V-delver, drains 2 feet deep and 3 feet wide at the top, can be quickly formed, and a week or two in the autumn could be profitably spent in making drains from crop paddocks to the main water-courses.

For the crabholey ground levelling is necessary. This can only be done by cultivation, and one of the quickest methods is by using the "smoodger" once or twice on the fallow during the season. Even by this means it takes several years of cultivation to get the land well levelled, but the labour will be well rewarded by the increase in the yields in the years following and in the value of the land.

LIGHT SOILS.

It is generally considered that the light soil is favored by a moderate rainfall, as in a wet season the surface runs together and cakes, while the water lies on the surface for a lengthy period and kills the wheat plants altogether.

The present season has been a wet one, and two very fine crops on light soils were entered by Caldow Brothers and Mr. H. D. Walker. The crop of the former was grown on sloping land which afforded good natural drainage, while in Mr. Walker's crop the land had less slope, but was ploughed in one chain lands and no water except in a few isolated crabholes lay on it. The wheat on the crowns was heavy and well headed as was also that growing for 8 to 10 feet in on each side of the furrows; between here and the crown again the crop was much thinner where less drainage occurred. Hence had the ploughing been done in half chain lands the whole crop would have had equally good drainage, and with it a correspondingly heavier yield. Mr. Walker states that it would have been very little extra trouble to have ploughed in half chain lands, and the result would have been from 1 to 2 bushels per acre better.

There is a natural tendency among competitors to withdraw from the Competition when their crop does not turn out as well as was expected, and I would like to mention that though the Competitions are held to find out the methods by which the best crops are produced it is almost as instructive to discover why a poorer crop failed, and it would greatly add to the value of the Competition if these crops were not withdrawn.

I wish to thank the President and officers of the society, especially the Secretary, Mr. D. Volwerg, for the excellent arrangements made in connexion with the judging, and am very grateful to those who supplied the means of transport at such a busy season of the year and who so warmly extended the hospitality of their homes.

MILK AND ITS PRODUCTS.*

By Edward Knox, Manager, Trafalgar Co-operative Butter and Cheese Factory.

In dealing with such a large matter in a short paper it is necessary to leave out so much which would be only needless repetition to the members of this Convention, that my paper might more justly be entitled "A few things about Milk," its ultimate aim being to draw attention to the scope existing for the manufacture of marketable commodities from what might be called the by-products of butter-making and cheese-making.

Briefly and simply stated, milk is the secretion of the special glands of the female mammal. The function of these glands is to extract water and certain solids from the blood and lead them to the milk ducts. Milk is primarily produced in nature as a food for the nourishment of the young, for which it is peculiarly adapted.

It has a specific gravity of about 1.031, and in an average sample would contain—

Water	87.55	per cent.
Butter fat	3.70	,, ,,
Casein and albumen ...	3.10	,, ,,
Lactose or milk sugar ...	4.90	,, ,,
Ash or mineral matter ...	.75	,, ,,
	100.00	

The casein, milk sugar, and ash are the non-fatty solids, which in the above sample amount to 8.75 per cent., while those non-fatty solids added to the butter fat contents make the total solids 12.45 per cent.

Of the solids of milk, casein and albumen represent the nitrogenous matter usually called protein and sometimes albumenoids. The nitrogenous matter of food is flesh-forming, its chief function being to build up and renew the tissue of the animal body.

Nitrogenous foods are called plastic foods or tissue formers, since no tissue can be formed without them. Nitrogen is a constituent of all organized living tissues, animal or vegetable.

The non-nitrogenous nutrients of food are the heat givers; they chiefly effect the maintenance of heat in the system, and are principally starches, sugars, and fats. In milk they are present as butter fat and lactose or milk sugar.

The ash or mineral matter of milk, though small in quantity, performs most important functions as a food. It is the great builder up of the bone and brain of an animal, its principal constituents being lime, potash and phosphoric acid.

Since heating renders the lime salts of milk to some extent insoluble, there is always a danger in feeding pasteurized milk to babies and young children. If pastuerized milk must be fed (and in summer it is no doubt necessary) some provision should be made to replace the mineral salts destroyed, either by the addition of lime-water or some other suitable means. Rickets in children are traceable to the use of foods deficient in mineral salts.

* A paper read at the Annual Convention of the Chamber of Agriculture, Sale, April, 1921.

The same thing applies to the misuse of sweetened condensed milk, which, if fed to infants exclusively and over a prolonged period, results in malnutrition and a loss of muscular development, owing to the excess of sucrose or cane sugar. Even though diluted, the carbohydrates are still far in excess of protein fat and ash.

Milk is the most valuable food we have, and the cheapest—a quart of milk being equal in nutritive value to one pound of beef steak.

Proteids, carbohydrates, fats, and mineral salts are essential to life, but one of the most important discoveries of recent years made by chemical investigators has been the finding of an hitherto unknown substance, contained in milk, butter fat, cod liver oil, and certain vegetables, which has been named vitamine, and which has been conclusively demonstrated to be absolutely essential to the function of animal growth.

Although the diet may contain the proteids, carbohydrates, fats and mineral salts essential to life, the absence of vitamine in the diet of the young animal leads to retarded and stunted growth, and certain diseases have also been traced to the same cause. The disease Beri-Beri has been found to be produced by the use of polished rice as a staple food, while the use of the same rice with the husk does not produce the disease, the vitamine being contained in the husk. Milk fat and cod liver oil contain these vitamines, and no other fat; hence margarine can never take the place of butter as a food for the growing human animal without detriment to its physical development.

Nutrition experts have classed three of these vitamine substances as—

Water soluble vitamines,
Fat soluble vitamines, and
Antiscorbutic vitamines.

The two former are not destroyed by heat, but the latter is. Therefore, it is recommended that evaporated milk fed to babies and children should have some other food substance added, such as orange juice.

A factory manufacturing butter produces approximately the same bulk and tonnage of butter milk as of butter made. This butter milk consists of—

Protein (casein)	3.50	per cent.
Milk sugar and lactic acid ...	4.00	,, ,,
Ash (mineral matter) ...	.70	,, ,,

the balance being water with a trace of fat.

Valuable a food for pigs as butter milk is, there are times of excess supply when it could be profitably dried and used for manufacturing a valuable calf, pig, and chicken food. Dried butter milk is also used for making medicinal foods, being highly recommended for weak digestions.

The baker and confectioner finds that to use butter milk, skim milk, or whole milk in his business is economy, as he not only improves the quality of his product by doing so, but also increases his output.

Butter milk mixed in certain proportions with skim milk can also be used in the making of casein for certain manufacturing purposes.

Skim milk may be regarded as the main by-product of dairying. The value of skim milk as a food for calves and pigs is very high, and it is no purpose of this paper to advocate the diversion of skim milk from what may be justly considered its natural use on the farm; a

large quantity of skim milk, however, is not put to its proper use, not effectively used, or not used at all. The writer remembers the time when the utmost difficulty was experienced by butter factory managers in getting the skim milk tanks cleared at various creameries under their care; compulsion having to be resorted to in many cases in order to get milk suppliers to remove their share of skim milk, only to tip it out on the road at the first convenient spot. The value of pigs has caused the dairyman to revise his ideas as to the value of skim milk. But there is another outlet for the use of this product, of which he had no conception some years ago, namely, the extraction of the casein therefrom for technical use in the arts and crafts and in a wide range of manufactures.

There are doubtless dairymen present who can remember the time, at the inception of the butter factory system in Victoria and the establishment of the export trade, when they were satisfied to obtain as low a price as 2½d. per gallon for their whole milk. They have since received over 1s. per gallon at the factory, and I firmly believe that the time is coming when the non-fatty solids of milk will return them a monetary result in a like ratio. This may appear a most optimistic forecast, but the possibilities of the utilization of casein and lactose have only, of comparatively late years, begun to be recognised and exploited to any large extent. It is certain that the methods now being used for the extraction of casein and milk sugar will be improved, cheapened, and perfected, while wider uses will be found for the products which already are proved of such great value in so many directions.

The extraction of the casein from the skim milk is not a difficult process. It is precipitated by rennet, pepsin, or acids, the whey drained off and the casein pressed and finally dried and ground into a more or less fine powder.

A number of butter factories in Victoria are now making casein as part of the regular work of the factory and find it profitable, being able to pay the milk suppliers 1½d. per gallon for their skim milk, or 3d. or 4d. per pound extra on their butter fat price. Provision is usually made for any supplier who prefers to take home his skim milk for use on the farm, to do so, or he can take home any smaller quantity he may require.

There is a good market for casein in Europe and America, its uses being so many and various. But why not work up this material into the finished article in Australia?

Among the uses to which casein is put is the making of a very fine material called "galalith," which is used for manufacturing combs, plates, cigar holders, tobacco pipe fittings, electrical insulators, &c. It is hard, inodorous, and uninflammable.

For Paints.—We all know the superior finish imparted to our whitewash in the factory and on the farm, when we mix the lime with skim milk. The casein is used in commerce for a like purpose, in manufacturing cold-water paints, such as kalsomine or distemper paints. It is also used for making enamel paint, stencilling paint, as a boiled oil substitute, and for making varnish.

For Glues.—Solid or liquid. Most of the three-ply veneers made in Australia are made with casein glue.

In Europe and America it is used as a substitute for meerschaum, for water-proofing fabrics, for manufacturing artificial linoleum, artificial leather, artificial horn, and for rendering celluloid uninflammable.

In Textile Industries.—For colour printing, for dressing yarn or fabrics to provide them with a metallic lustre, for fixing mineral pigments to enable them to stand washing, and for many other purposes.

In the Paper Industry.—For making water-proof paper and cardboard boxes, washable wall papers and transfer papers. For waterproofing paper pulp dishes, for stereotype matrices, and for sizing paper.

It is also largely used in soap-making.

Many casein foods have been for some time on the market. Casein is considered to be equal in nutrient value to lean meat, and is readily absorbed in the system. The food substance known as "Sanatogen," and many of a like nature are largely composed of casein, while plasmon, plasmon bread, plasmon biscuits, plasmon cocoa and chocloate, all have a casein base.

A substitute for egg albumen is also manufactured from casein. These are a few of its uses, there are many others, and new ones are continually being discovered.

Dried Milk.

Dried milk is usually made by one of two processes, being either roller or film-dried, or spray-dried.

In the former process the milk is passed over a pair of hollow rollers through which steam passes, heating the milk, which dries in the form of a film on the rollers, and is removed by knives or scrapers coming in contact with the length of the rollers while they are revolving, thus removing the film of dried milk; it is then broken up and put through a mechanical sifter, screen, or bolting machine, and emerges as a powder. As high temperatures reduce the solubility of the powder, one machine has been designed to work in a vacuum chamber, thus enabling the work to be done at lower temperatures.

The spray process of drying is performed by partially condensing the milk and forcing it through a very fine orifice in the form of a spray of fine atoms into a heated chamber, where, on parting with its moisture, it falls in a fine flaky powder. The moisture is carried away, fine screens preventing the escape of any particles of the powder.

The application of heat has a tendency to destroy the solubility of milk when in a liquid state, but by partially condensing the milk before spraying, this is overcome, besides making the process more economical than spraying the milk without reducing the bulk. The fineness or coarseness of the powder can be regulated by the fineness of the orifice through which the milk passes in spraying.

Milk powder made by the spray process usually contains less moisture than the film-dried. Milk, being partially a solution and partly an emulsion, the great aim in drying milk is to produce an article which is readily soluble. The lower the acidity of the milk treated, the more soluble the product.

In the drying of whole milk, the method usually adopted is to skim the milk, condense the skim, and then add the cream before spraying. This prevents the butter fat, which is very susceptible, from being affected by the metallic contact of the copper pan.

The other by-product of milk—whey—contains over 4 per cent. of lactose or sugar of milk. A Western District dairying company is now utilizing its whey for the manufacture of this product. It is largely used in the preparation of infants' foods and for compounding medicines.

Dried powdered butter milk and powdered skim milk have been manufactured in Victoria to some extent during the past two years, and recently a considerable quantity of dried whole milk has also been made for export, which, I understand, is being used in the manufacture of chocolate.

With wide and increasing markets and enlarging demands for these products, it will be worth the while of manufacturers of butter and cheese to consider the utilization of their butter milk, skim milk, and whey, and although the present markets for these are mostly overseas, the time will no doubt come when the working up of casein products will be done in our own country.

So far as the dairying industry is concerned, the greatest need at the present time in Australia is for dairy chemists to concentrate their energies upon research work. Our knowledge of milk (notwithstanding all that the world's dairying students have achieved) is still capable of being infinitely extended. To the man with large vision the study of milk and its products in the laboratory and in its various processes of manufacture, offers a life work of usefulness.

Unfortunately, owing to the varied nature of their duties, factory managers cannot afford that concentration on the chemical side of the work necessary for satisfactory investigation. And I would here throw out a suggestion: Cannot the dairy companies of Victoria or the co-operative dairy companies, through their organization, discover and capture some brilliant University man who has shown an aptitude and enthusiasm for this work, and retain him in a position sufficiently well paid to make it worth while to devote himself to this work of investigation and make it his career? It would be more satisfactory than looking for the Government to provide the man, and the cost to each dairy company contributing would be small compared with the advantages gained. Problems which beset the factory manager could be passed on for solution, and much knowledge gained in the process of investigation. But get the right man. Why should not Australia produce the great dairy chemist?

SIZE OF HOOFS.

The size of the hoofs depends not only upon the treatment they receive at the hands of the shoer, but also on the climate and the nature of the soil. It is not at all uncommon to find what are called odd-sized feet belonging to the same horse. These (says a writer in an English stock journal) are generally fore feet, and they may be perfectly free from disease. One foot smaller than the other is often congenital, and this neither predisposes to disease nor is an indication of morbid condition unless the animal is lame. Large hoofs with prominent frogs are generally found in moist countries. Narrow, small feet with hard, dry horn and rather diminutive frogs and concave soles are usually observed in dry climates and in rocky or sandy soils. Black hoofs are composed of tougher horn than white ones, and the hoof which has not had the front and side of the wall rasped by the shoer, or its texture damaged by oil or hoof ointments, is generally smooth and shining.

RESISTANT STOCKS.*

By F. de Castella, Government Viticulturist.

When I had the honour nearly twelve months ago of addressing the first Australian Wine Congress, held in Sydney, I endeavoured to point out, in the most emphatic terms I could command, the gravity of the phylloxera menace and the wisdom of establishing none but vineyards which have nothing to fear from phylloxera—in other words, on resistant stocks. And this not only in localities to which the devastating insect has already found its way; even in districts as yet clean, and seemingly remote from infection, the planting of any but resistant vines is improvidence of a foolhardy kind. Foex's prediction of thirty-five years ago has proved only too true. Reviewing the phylloxera situation of the world in 1886, he said, "It is probable that in a not far distant future phylloxera will have reached every part of the world where vines are grown."

I was much gratified with the flattering reception accorded to my paper, even in quarters where it was not unreasonable to expect a certain amount of hostile criticism of the views I expressed—views which, at the risk of being distasteful to some of my good friends, I felt it my bounden duty to emphatically state.

The necessity for the resistant stock being admitted, the question which naturally arises is, "What is the best stock to plant?" It is this question which I shall endeavour to answer in the present paper; nor is the answer quite as simple as might at first sight appear, for there are many good stocks, one or more of which may prove more suitable than others under a given set of circumstances. Unlike our apple growers, who almost exclusively pin their faith to the Northern Spy stock for protection from woolly aphis, which, incidentally, is rather closely related to phylloxera, the vine-grower has a considerable number of stocks to select from. Since the dawn of reconstitution in the seventies, hundreds of stocks have been tried and planted on an extensive scale. The great majority of these have been found wanting, and discarded often after a period of great popularity due to the high hopes founded on them by leading authorities.

There are thus stocks of the past, the present, and the future. Little need be said of the first; their interest is mainly historical, though a couple of them may still render service under some special circumstances. The stocks of the present are, of course, the most important ones; fortunately their number is not considerable. Those which enjoy the greatest measure of popularity in Victoria to-day may be counted on the fingers of one hand. A few more are gradually forcing their way to the front, but there is a still larger number of stocks of proved value which for various reasons have not been extensively planted, sometimes because they have not been so much boomed by nurserymen.

Even recognised authorities have sometimes unduly favoured a new and promising stock which has not stood the test of time and experience on a large scale. I suppose it is only human nature to become enthusiastic about a new plant, especially of one's own raising, but it is well in this connexion to remember the old adage about "the devil we know." Such recommendations on insufficient grounds are unwise and

* Paper read at the Adelaide Wine Congress, May, 1921.

unfair; it really amounts to backing one's own personal opinions with other people's money, which is, of course, unthinkable.

There is, unfortunately, no stock which can be singled out in a general way as the best of all. For given conditions of soil, climate, and scion variety, one stock is usually better suited than others, though it is, of course, also possible that two or more stocks may give equally satisfactory results. It is obviously desirable to only plant the best stock for each particular case—that is to say, the stock which will produce the heaviest yield of the best possible wine (or other vine produce), and this over a long series of years; in other words, the stock must insure quantity, quality, and longevity. The qualifications looked for in a stock are often in conflict. Thus, quantity and quality are to a certain extent antagonistic, as are also fruit production and vigour of vegetation. The last named sometimes tends to mislead the beginner. Vigorous growth, though very attractive, is not everything; we want, after all, to grow grapes, and not wood. It sometimes happens that the vine which grows most canes and leaves yields little fruit; it is usually in the moderate or middle course that the greatest measure of satisfaction will be found.

I have endeavoured to sum up the evidence for and against each stock as impartially as possible, leaving it to the grower to decide. Though I have been largely guided by Victorian experience during the past twenty-one years, I have also availed myself of recent French and Spanish viticultural literature. A vast amount of evidence is thus available on the subject of resistant stocks, which, unfortunately, is sometimes contradictory. I have, therefore, endeavoured to confine myself to facts concerning which there is general agreement.

It is well to here point out that our experience of the resistant stock has been mainly gained in Rutherglen and adjacent localities in north-east Victoria, and it must be admitted that most of these vineyards have been planted on remarkably suitable vine land—suitable more particularly for resistant stocks, and this both chemically and physically. Chemically, in the absence of lime in excess; chlorosis, so frequent a cause of trouble in Europe and Algeria, is unknown in our north-east, and we are able to use stocks which may prove unsuitable in some parts of Mildura and South Australia on limy soils. Physically, Rutherglen soils are of distinctly "easy" types. The yellow box (*E. melliodora*), so frequent in the district, is a remarkable soil—and more particularly subsoil—indicator. Wherever this tree grows spontaneously almost any resistant stock will thrive. In some other parts of the Commonwealth it is quite likely that problems may arise such as are unknown in northern Victoria.

What are Resistant Stocks? Why and How do They Resist?

Resistant stocks are the indigenous or wild vines of eastern North America. They resist because they have since pre-historic times grown in company with, and in spite of, phylloxera. Resistance is thus the outcome of the co-existence during countless centuries of these wild vines and the insect in the native habitat of both.

Before the balance of nature was disturbed by the action of man, phylloxera only existed in the eastern portion of the North American continent. The Rocky Mountains dividing range proved an insuperable natural barrier. West of the Rockies there was no phylloxera until it was unwittingly introduced. In California thriving vineyards were

established by the Spanish missionaries, the success of which was in strong contrast to the repeated failures which always attended early attempts to establish vineyards with European vines in the eastern States, the explanation of which was not forthcoming until the solution of the phylloxera riddle many years later.

The mechanism of resistance is to be found mainly in the special structure of the root tissues. The injury caused by the punctures of the insect is much more deeply seated in the European than in the American vine. With the former the cambium and even the medullary rays are involved; in the latter the bark only is affected. According to Foex—

> In the case of *Vitis vinifera*, the penetration of the medullary rays causes, after a certain number of attacks, the consecutive alteration of the fibro-vascular bundles, the anatomical elements of which become penetrated by liquids charged with decomposition products derived from the cellular tissues, resulting eventually in the destruction of the roots. In the case of the resistant American, surface damage only occurs, which ends with the cicatrization of the tissues, and the formation of a sort of scab, which is soon detached owing to the production by the conjunctive tissue of the bark of a corky layer, which isolates the damaged part.

The lesions caused by phylloxera on the roots are of two kinds—*nodosities*, which only affect the small root terminals, and, therefore, do little damage, since the vine is capable of rapidly replacing them; *tuberosities*, which are situated on the larger roots are infinitely more dangerous, since a deep-seated tuberosity is capable of cutting off a large root. When a sufficient number of roots are thus cut off, the vine must die. On resistant stocks which possess this quality in a high degree tuberosities are scarce and shallow; they do not penetrate deeply enough to sever a root, and are gradually exfoliated as described above.

Nor does phylloxera multiply to any great extent on the American vine; it certainly does not swarm on its roots as it does on those of the Vinifera varieties. According to Ravaz, "the most resistant vines are those which are least attacked by the insect. But why does it attack them unequally? Solely because the roots of certain species are pleasing to it, whilst others please it less. It is as a matter of fact the 'taste' of the roots which directs the insect and causes it to choose. When it has not the choice it may invade even the most resistant vines, but then with only very slight intensity."

Phylloxera can live on the roots or on the leaves, in the latter case forming galls. On the American vine it prefers the leaf to the root; on the European vine, on the other hand, it lives almost exclusively on the roots, the leaf form being exceedingly rare. Curiously enough, in Australia the insect does not seem to favour the leaf of the American vine; though galls are frequently to be found on the leaves of resistant "mother vines" in France and America, they are exceedingly rare in northern Victoria.

Whereas in Europe and western Asia only one species of vine exists naturally, there are in America many distinct indigenous species. It seems hard to realize that varieties so dissimilar as Miller's Burgundy and Pedro Jimenez, as Muscat of Alexandria and Sultana, should all belong to the one species, viz., *Vitis vinifera*, nevertheless it is a point on which botanists have long been in agreement. In America, on the other hand, there are many species; though authorities are not altogether in accord concerning their classification, it is generally admitted that there are at least eighteen distinct North American species of *Vitis*. Three

of these are of no interest as stocks, viz., *V. rotundifolia*, *V. munsonia*, and *V. californica*. The first two belong to the *Muscadinia* section, and though their phylloxera resistance is of the highest order, they differ so radically from the true vines or *Eu-vites* section that the graft with the European vine is of very short duration. *V. californica* does not resist phylloxera, which is not surprising, since it is indigenous to the part of America where phylloxera did not naturally exist.

Of the fifteen remaining species, four only play a preponderating part in present day reconstitution. These are *V. riparia*, *V. rupestris*, *V. berlandieri*, and *V. cordifolia*. *V. labrusca* and *V. æstivalis* are mainly of historic interest, since, together with their hybrids, they figured largely in the early days of reconstitution. A few other species deserve mention, since they play some part in the breeding of several hybrid stocks. These are *V. arizonica*, *V. monticola*, *V. cinerea*, *V. candicans*, and *V. lincecumii*. The last has been much used in the breeding of direct producers.

Notwithstanding Europe and America being so far apart, most of the indigenous species of the latter continent are sufficiently closely related botanically with *V. vinifera* to hybridize freely with it, and to be easily grafted to it.

Let us not forget how much we owe to France in this connexion. We have to thank America for the resistant stock; but we also have to thank her for phylloxera. It is, indeed, in the fitness of things that she should supply the remedy for the devastation of which she was indirectly the cause.

It is to France, however, that we are indebted for the patient research and brilliant investigational work which have made the resistant stock the success it now is.

Few pure forms of American species are to-day used as stocks. The majority of those now planted are hybrids, of which vast numbers have been raised. Though it it would be out of place to attempt anything like a list of stocks, most of which are now obsolete, the general trend of the evolution of modern reconstitution may be briefly outlined. The first Americans tried in France were never intended as stocks, the necessity for which was as yet unthought of. Laliman, of Bordeaux, noted as early as 1869 that certain American vines, grown for the fruit they yielded, continued to thrive amid Viniferas dying of phylloxera. These early resistants were hybrids propagated on account of their fruit; among them were Clinton and Concord, which were at that time the two sorts most extensively grown in the eastern States of the Union. Cuttings of these and of several other allied varieties were imported into France by the hundred thousand. This was, according to Sahut, the period of expectation—French vignerons realized with joy that vines could still be grown, and wine—of a kind—made, in spite of phylloxera. The great bulk of these early plantations were more or less complete failures; only in a few special soils unsuited to phylloxera was any success attained.

The next period, 1874-78, saw extensive planting of a new set of vines, such as Cunningham, Norton's Virginia, Herbemont, Taylor, &c., which failed almost as completely as their predecessors.

Real progress was made in the next period, 1878-82, when vines of greater merit were introduced, such as Jacquez and Othello—vines which are still cultivated in France to-day, though now only as direct producers. Jacquez, as will be seen later, is still employed in some quarters as a stock, in South Africa and California, for example.

But much greater success was at hand, and 1880 saw the initiation of what Sahut calls the period of grafting, which has continued to the present day, and seems destined to do so indefinitely. After ten years' trial of the older direct producers it was at last recognised that the true *rôle* of the American vine is that of stock on which to graft the European varieties. Grafting became really active in 1882, the leading stocks being Taylor, Vialla, Champin, York's Madeira, Solonis, and the Wild Riparia, and Rupestris, whilst Jacquez continued to be planted both as a stock and as a direct producer. Most of these stocks are but memories now. Jacquez is still grown in France as a direct producer of full, deep-coloured wines, but it has been abandoned as a stock owing to insufficient phylloxera resistance. It may be here noted that the same vine, which may resist sufficiently if ungrafted, resists much less when grafted with Vinifera scion. Vialla is still interesting, owing to the ease with which it can be grafted and its affinity for difficult scions; it may perhaps prove of value for sandy soils, or under irrigation, where its rather poor resistance will be of no consequence. It is, however, very intolerant of lime.

Pure American Species.

The real triumph of the grafted vine may be summed up in the word Riparia. Fortunes were made by nurserymen who imported from St. Louis cuttings of wild riparias growing in the woods on the banks of the Mississippi and Missouri rivers. These were usually sold by the kilomètre—1,000 cuttings each 1 mètre long.

The Riparia stock has valuable and highly attractive qualities. It is easy to graft, and confers great fruitfulness on the scion, especially during the first few years; hence it became easily the most popular stock during the most active period of French reconstitution. In 1895, by which time 1,730,000 acres had been reconstituted, two-thirds of this area were on Riparia stocks. From the wild vines first imported the best types were gradually selected and multiplied. Quite a number of distinct Riparias were at one time on the market, the most important of which were Gloire de Montpellier and Grand Glabre. The former proved the better of the two, and it is the only one now propagated in Europe, where its popularity is, nevertheless, steadily declining.

Besides its undoubted qualities, Riparia has several defects. It is very susceptible to excessive lime, and hence unsuitable in calcareous soils. As its name implies, it is the river-side grape, and only does really well in rich, deep, loamy soils When grafted the stem remains slender, the scion outgrowing the stock, with the result that after a few years of heavy yields vigour decreases, and the vine must be restored by heavy manuring and short pruning for a couple of seasons. In Victoria we have altogether discarded Riparia, and no longer propagate it; it is certainly unsuited to our warm climate, and we have now other stocks which possess its qualities in equal measure, whilst they are free from its defects.

V. rupestris next attracted attention. Being the "rock" vine, it is not surprising that it should possess qualities lacking in the Riparia, or river vine. Coming, as it does, from the Southern States, it should also prove more interesting than Riparia in our Australian climate. Even in France it was not long before Rupestris superseded Riparia. At the time of my visit to France, in 1907-8, one of its varieties,

R. du Lot, was the most popular stock, at least in Herault. This is the stock which is much used in California under the name of Rupestris St. George. Of the many Rupestris selections—Martin, Ganzin, and several others—du Lot alone has stood the test of time in France, where it is the only pure Rupestris now propagated. In north-eastern Spain it was fourteen years ago easily the most popular stock. In response to my question as to which were the leading stocks in the neighbourhood of Barcelona, one of the local authorities replied in characteristic Spanish fashion, "There are three; there is Rupestris du Lot, then there is Rupestris du Lot, and yet again Rupestris du Lot."

In soils which suit it, and for scions which fruit well on it, du Lot is one of the most valuable stocks, but it has also its shortcomings. The vigour of its vegetation makes it unsuitable for scions which have any tendency to faulty setting of the blossom. At Rutherglen, Malbeck on du Lot is most disappointing; the vines are exceedingly vigorous and healthy, but bear very little fruit. It also requires a deep soil, though not necessarily rich; unless its powerful roots can get well down into the subsoil it suffers from drought almost as much as Riparia. It is the ideal stock for dry, stony hillsides, provided the subsoil is easily penetrated by the roots. It does well grafted with most European scions. It has the reputation of being liable to root rot in badly-drained soils, and will probably prove less suitable than some other sorts under irrigation.

In Victoria we have also planted, on a moderate scale, a seedling Rupestris, raised at the Cape, and known locally as Metallica Cape. The evidence concerning this stock is contradictory, and since it is being more or less discarded at the Cape, there seems no reason for us to further propagate it, though it is true that Shiraz grafted on this stock at the Viticultural Station nearly twenty years ago still yields excellent crops.

The only other pure American species now used as a stock is *V. berlandieri*, a very remarkable vine, and one which seems destined to play, though mainly in hybrid form, a large part in Australian reconstitution. Its use on a large scale was first advocated by P. Viala, as the result of his mission to America in 1887, whither he was sent by the French Government to secure a wild stock capable of growing in chalky soils, in order to render possible the reconstitution of similar soils in France, on which most of the stocks first planted soon succumbed to chlorosis. In addition to its remarkable lime tolerance, Berlandieri has several other qualities of the highest value. It is remarkably easy to graft, and possesses great affinity for most Vinifera vines, to which it imparts a very high degree of fruitfulness. Being a native of the hottest and driest parts of Texas, it is highly drought-resistant, and should be quite at home in the warm, dry Australian climate. Though resistant to lime, this element is by no means necessary to it, and in soils free from excess of, or even deficient in, lime it retains the striking qualities above outlined.

Every medal has its reverse, and *V. berlandieri* has two serious defects which have so far militated against its extensive propagation. Its cuttings strike with great difficulty, and its poor growth during the first few years make it hard to realize the strong stock it is capable of growing into. A peculiarity of this vine is that it grows more below than above ground, forming a powerful root system, but only making

poor twiggy growth above ground. When grafted with the quicker-growing European scion the upper portion develops normally and in proportion to the strong root system, but the young vine is seldom big enough to graft before the second season from plantation. Were it not for these defects it is probable that *V. Berlandieri* would ere this have superseded all other stocks. These have been largely overcome by hybridization, and although the pure Berlandieri is quite extensively used in France and Algeria, hybrids of this species with other vines are much more extensively propagated: they constitute, in fact, some of the most interesting and promising resistant stocks. One of these, Berlandieri x Riparia No. 420A, is to-day increasingly popular at Rutherglen; in Algeria likewise it is very highly spoken of.

Hybrid Stocks.

We are thus brought to the question of hybrid vines, which have largely superseded the pure American species. In hybridization remarkable things happen. It is, for example, possible for a hybrid vine to inherit the good qualities of two dissimilar parents, and to be free from the defects of one or even of both. Though such an accommodating freak is the exception and not the rule, a limited number of such very convenient and desirable hybrids have at rare intervals been raised, and these constitute the basis of present-day reconstitution. Such hybrids are of different degrees of complexity. In addition to binary hybrids between two different species, there are ternary, quaternary, and even more complex hybrids; comebacks are also possible, such as 84-3, which is a seedling from a Vinifera crossed by No. 1202, itself a Vinifera x Rupestris hybrid. In designating hybrids it is usual to mention the pollen parent last thus Riparia x Rupestris No. 3306 had for its mother or fruit-yielding parent *V. riparia*, the flower of which was fertilized with Rupestris pollen. In the cross-breeding of vines the pollen parent is usually prepotent, though not invariably so.

Hybrid stocks may be divided into two important groups—

(1) Vinifera x Americans, or, as they are usually termed in France, Franco-Americans.

(2) Americo x Americans, in which both parents are American wild vines.

The former group might at first sight be suspected of diminished phylloxera resistance, owing to their Vinifera breeding. As pointed out above, queer things occasionally happen in cross breeding; sometimes the offspring may inherit almost *in toto* a character of one parent. The Vinifera Americans largely used as stocks are individual seedlings which have inherited almost integrally the resistance to phylloxera of their American parent. We have in this group some very valuable stocks, which are being largely planted in Victoria to-day, notably, Mataro x Rupestris No. 1202, and A.R.G.1, initials which are an abbreviation of its full name indicative of its breeding, Aramon x Rupestris Ganzin No. 1. Of this particular hybridization three individual seedlings have been multiplied, numbered respectively 1, 2, and 9. A.R.G.1 is the best known of these in Victoria, and also in France, though A.R.G.9 is increasing in popularity; it has long been held in high repute in Spain.

In this group may also be mentioned No. 601 (Bourrisquou x Rupestris); No. 3103 (Colombeau x Rupestris Martin), also known as Gamay

Couderc; No. 33A (Cabernet x Rupestris); and 81-2, a spontaneous Vinifera x Rupestris hybrid; 84-3, a comeback on the Vinifera side; and the Vinifera x Berlandieri hybrid 41B, and 333. These last two can, however, be more conveniently dealt with in connexion with the other Berlandieri hybrids.

The wisdom or otherwise of utilizing Vinifera x Americans as stocks has, in Europe, given rise to an immense amount of discussion which can be better considered in connexion with phylloxera resistance. So far we have had no fault to find with these hybrids on the score of insufficient resistance, but Rutherglen soils are not what the French term "phylloxerating" soils; under conditions where the insect is more virulent, and especially in shallow, limy soils, it may be well to use them with caution. Under irrigation phylloxera is not very active, and A.R.G.1 in particular is giving complete satisfaction wherever planted. It shows considerable affinity for most European scions grafted on it, which grow strongly and yield well. It suffers from faulty drainage less than most stocks, a point of importance under irrigation conditions which it shares with No. 1202, though the scions grafted on the latter are perhaps a little less fruitful. 1202 is chiefly remarkable on account of its great tolerance for lime. Another stock belonging to this group is 93-5 (Bourrisquou x Rupestris). Though raised in France by Couderc, it has until recently been little used in that country, though it has long been extensively planted and highly appreciated in Northern Spain and Algeria.

Americo x American Hybrids.

In this section we have some stocks of the highest merit, which can be grouped under several sub-headings, such as Riparia x Rupestris, Berlandieri Hybrids, Cordifolia Hybrids, and sundry other stocks.

Riparia x Rupestris.

By crossing the "River grape" with the "Rock grape" several remarkable hybrids have been raised in which the good qualities of the former have been retained and its defects corrected. These stocks are highly phylloxera-resistant, and much less exacting as regards soil richness than Riparia; they are easily propagated and grafted, forming stout, fruitful vines of long duration. They are distinctly more lime-tolerant than either parent, and do well in soils containing up to 20 per cent. of lime carbonate. Of the many Riparia x Rupestris hybrids only three are now in general use; they are known by the numbers 3309, 3306, and 101-14.

No. 3309 most resembles Rupestris, whilst 101-14 takes more after the Riparia parent, for which reason it seems to be the least valuable of the three under warm Australian conditions. So far it has played but a small part in Victorian reconstitution, but it may prove of use for rich soils, especially in the cooler districts.

Nos. 3309 and 3306 are among the most popular stocks in north-east Victoria, where they have been very extensively planted, and are giving most gratifying satisfaction, grafted with many different scions. European authorities usually recommend 3309 for hillside and 3306 for flat. The former has the reputation of being rather more drought-resisting, but evidence on this point is somewhat contradictory. In Rutherglen both are grown on hill and on flat, and little, if any, difference can

be noted. In the granitic soils of the Hermitage Hill, near the Rhone (France), 3309 is the favorite stock for Syra (identical with our Shiraz). No. 3306 has the reputation of suffering less from faulty drainage than most stocks; it should, therefore, be suitable for irrigated vineyards. At Shepparton, however, it is not proving equal to A.R.G.1 under these conditions. In one Mildura vineyard quite a number of vines grafted on 101-14 died out as the result of their inability to stand watering in midsummer.

Berlandieri Hybrids.

These retain the remarkable lime tolerance, scion fruitfulness, and longevity of *V. berlandieri*, whilst its difficult root formation and slow growth when young are largely corrected. Owing to the facility with which the graft takes, they are admirably suited for field grafting, but much less so for bench grafting, from which only a poor percentage of success can be expected. The graft takes readily, but slow root formation by the stock results in the scion starting to grow and exhausting itself before there are any roots to supply it; hence many grafts fail in the nursery. *V. berlandieri* has been crossed with several different species, thus giving rise to different groups.

Berlandieri x Riparias.

The best-known of these are the numbers 420A, 34E, and 157-11, the first of which is the only one which has as yet been extensively planted in Victoria, where it has recently come right to the front as regards popularity, especially for field grafting. Every grower who has tried it speaks enthusiastically of it. Though growing rather less vigorously than some other stocks the first year, it soon makes up for its slow start, especially when grafted, forming a strong and very fruitful vine. Its resistance to phylloxera is high; it also resists drought well, and inherits from its Berlandieri parent great toleration for lime, at least equalling 1202 in this respect. Though not as yet tried under irrigation here, it should maintain its high reputation, provided drainage be satisfactory; *V. berlandieri* and its hybrids do not like "wet feet." In Algeria, where the climate is so similar to ours, 420A is very highly thought of; Bertrand prefers it to any other stock.

Nos. 34E and 157-11 have not been tested to any extent in Victoria. They possess similar qualities to 420A, though they do not seem to quite equal it in drought resistance and scion fruitfulness. 157-11 fears "wet feet" less than most of the group, for which reason it may be of service in irrigated vineyards.

Another interesting hybrid is 161-49, which differs from the foregoing in being a Riparia x Berlandieri, the latter species being pollen parent. Unfortunately, none of the rootlings imported in 1908 survived, hence we do not possess this vine in Australia. It has been highly spoken of recently, and is claimed in some quarters to even surpass 420A in drought resistance and scion fruitfulness. Its cuttings are, however, more difficult to strike.

Berlandieri Rupestris.

The popularity of Rupestris du Lot and other Rupestris hybrids should make this group interesting, especially in warm dry districts.

Several stocks of merit has been raised, notably 219A, 301A, and 301-69, which we grow at the Rutherglen Viticultural Station, though they have not been tested on a practical scale. As regards scion fruitfulness, and even drought resistance, they do not seem to equal 420A, at least in free deep soils. In stiff soils they may prove of more value, as their fleshy roots tend to plunge deeply. The group seems to have been neglected, in France as well as here, no doubt largely because they are not profitable to a nurseryman; the mother vines yield rather poor, twiggy wood. These stocks certainly merit further trial.

Vinifera x Berlandieri.

This group is mainly interesting owing to its suitability for soils with high lime content, in which few other Americans can be grown. Vines grafted on them are very fruitful, drought-resistant, and there is excellent affinity between stock and scion. No. 41B (Chasselas x Berlandieri) and No. 333 (Cabernet x Berlandieri) are the best known. The first-named has been planted to some extent near Rutherglen, grafted with Syra, and though quite satisfactory it shows no marked superiority over several better-known stocks. In one vineyard it took about seven years to reach full bearing. No. 333 has not yet been planted to any extent in Victoria. It is very highly spoken of in France, and certainly merits further trial.

Other Vinifera x Berlandieri which deserve mention are 19-52 and a few not yet introduced here, such as 19-62, 422A and B, and 150-15; the last-named is a ternary hybrid (A.R.G.1 x Berlandieri) raised by Mallègue, well spoken of recently in France and Algeria.

Cordifolia Hybrids.

Although *V. cordifolia* is not utilized at all in its pure form, owing mainly to the difficulty with which its cuttings strike, this interesting species has played a part in the breeding of several valuable hybrids, which inherit the remarkable qualities of the Cordifolia parent. Being a native of the warmer parts of North America, this vine is highly drought-resistant; it is also able to thrive in stiff silty soils which become hard and dry in summer, but into which its powerful root system is able to plunge deeply. It is, however, exceedingly intolerant of lime, and in soils containing this element in appreciable quantity stocks of this group are contra-indicated. It is, no doubt, because limestone formations are so frequent in France that Cordifolia hybrids are not more used; they seem destined, however, to play an important part in Australian reconstitution in all districts with soils of low lime content.

The best known member of the group is No. 106-8—Riparia x Cordifolia Rupestris de Grasset, and, therefore, a ternary hybrid. This stock is very highly spoken of in Tarn Department, near Armagnac, where it does better than any other in the stiff, silty soils at the foot of the Pyrenees, where the geological formation is not unlike some parts of north-east Victoria. At Rutherglen this stock is doing well, forming vigorous, fruitful, and drought-resistant vines.

Other stocks of interest in this group are Cordifolia x Riparia No. 125-1; Rupestris x Cordifolia No. 107-11; and the ternary hybrid No. 62-66, which is No. 3103, or Gamay Couderc (a Vinifera x Rupestris), pollinated by *V. cordifolia*. All three are promising stocks for stiff,

silty soils, provided they contain little lime. No. 62-66 is said to be a good stock for difficult scions, such as Gordo Blanco.

SUNDRY OTHER STOCKS.

Other interesting stocks which we are trying at Rutherglen are the following:—

No. 554-5 a quaternary hybrid, in the breeding of which four distinct species are concerned, for it is an Æstivalis Monticola x Riparia Rupestris. It may prove of value for shy-bearing scions.

No. 160-19, Rupestris x Calcicola (synonymous with Monticola). According to Sr. Salas y Amat, a good stock for Gordo Blanco at Malaga (Spain).

No. 81-22, Rupestris x Arizonica.

Nor can we omit several stocks which have played a great part in the earlier days of reconstitution, and which are still used in certain quarters, viz.:—

Vialla—A Clinton (Labrusca x Riparia) seedling which resembles *V. labrusca* more than Clinton does; perhaps still of use in sandy soils and under irrigation for difficult scions.

Jacquez or Lenoir, of obscure origin. According to Ravaz, an Æstivalis-Cinerea-Vinifera. Munson holds it to be related to *V. bourquinia*, a species which is not admitted by French authorities. Though still interesting as a direct producer in sandy soils, Jacquez is no longer used as a stock in France; it is strange that it should still be used as such as in California and at the Cape.

Solonis—A spontaneous hybrid, considered by Ravaz to be a Riparia-Rupestris-Candicans, which was at one time very widely planted. Though now abandoned as a stock, a hybrid between it and *V. Riparia* is still in use; it is said to tolerate a good deal of salt in the soil.

The following table of the different stocks in general use will show at a glance the breeding of each one:—

Table of Leading Stocks.

PURE SPECIES—

Vitis riparia.—Riparia Gloire de Montpellier.
Riparia Grand Glabre.

Vitis rupestris.—**Rupestris du Lot.**
Do. Metallica (Cape).

Vitis berlandieri.—(Several selections.)

HYBRIDS—

Vinifera American Hybrids—

Vinifera x Rupestris.—**A.R.G. 1, —, 2, and 9.**
No. 1202.
81–2.
33A.
84–3.
3103 (Gamay Coudorc).
601.

Vinifera berlandieri.—**41–B.**
333.
19–52 and 19–62.
422A and B.
150–15.

HYBRIDS—*continued.*

Americo-American Hybrids—

Riparia x Rupestris.—**3309.**
3306.
101–14.

Berlandieri hybrids.—Berlandieri x Riparia—**420A.**
34E.
157–11.

Riparia x Berlandieri—161–49.

Berlandieri x Rupestris—219A.
301A.
301–64.

Cordifolia hybrids—**105–8.**
125–1.
107–11.
62–66.

Sundry other stocks—554–5.
160–19.
81–22.
Vialla.
Jacquez.
Solonis.
16–16.

Of this rather formidable, but by no means exhaustive, list five stocks have been much more extensively used in Victoria than the rest; these are—

Rupestris du Lot.
Riparia x Rupestris 3309.
do. do. 3306.
Vinifera x Rupestris A.R.G.1.
do. do 1202.

These may be termed the five fundamental stocks, so far as Victorian reconstitution is concerned. To them must be added 420A, which of late is coming right to the front in public favour, and 106-8, which, though less in demand, is becoming better known and more extensively planted

(*To be continued.*)

FEDERATION WHEAT IN INDIA.

On the Peshawar Farm in the North-west Province, the Australian wheat Federation again gave better results on rich soils than Pusa 4 (one of the types distributed for extensive cultivation), the maximum yields being 2,800 lbs. and 1,600 lbs. respectively. Pusa 4, however, responds remarkably well to judicious irrigation, and it has, therefore, been taken up by cultivators possessing good irrigated land. It was harvested on no less than 40,000 acres during the year under review, and is estimated to yield about 160 lbs. per acre more than the local wheats replaced. On the merits of the Australian wheat, the Agricultural Officer of the Province remarks that, "On the very best irrigated land under really good cultivation, Federation can positively be depended on to yield an upstanding crop of over 2,400 lbs. per acre in almost any year."

—Review of Agricultural Operations in India, 1919-20.

PEACH GROWING IN VICTORIA.

(Continued from page 230.)

By A. G. McCalman, Orchard Supervisor.

IX. PRUNING—*continued.*

Figure 25 (1) is a photograph of a lateral carrying a number of bloom buds and some wood buds. The buds marked D each consist of two bloom buds with small flat wood buds between them. The bud marked F, about the centre of the lateral, consists of a single bloom bud. It is large and rounded, compared with those just above it, marked W, which are single wood-buds, pointed in shape. Near the apex are three large single bloom buds F, and a large wood bud T W, at the terminal point. This portion of the lateral is capable of producing fruit at each of the places where bloom buds are seen for one season only. After bearing the shoot becomes barren, and if it be retained on the tree fruit will only be possible on an extension of growth from the terminal wood bud, or from the product of one of the wood buds down its length. It is generally best to remove it completely in the winter, after it has borne fruit.

A triple bud (D) is capable of producing fruit from its two outer bloom buds, and the central wood bud will grow into a shoot if induced by sap pressure. This lateral (Fig. 25 (1)) is therefore of the class that should be retained when pruning, to obtain fruit. Some laterals have no bloom buds and some have no wood buds, except the terminal wood bud, and vary in length, sometimes being only two or three inches long, but if the pruner sees the rounded bloom buds on them he may be sure that they are capable of producing blossoms.

Figure 25 (2) shows a lateral which was not removed after fruiting. From C to D is two-year old wood. From the terminal bud at D it grew the following season to E, and a wood bud at F grew from F to G. This shoot from C to D is barren. The short growths marked S were wood buds, which have developed into spurs, and have no bloom buds on them. They are called abortive spurs. The growths from D to E and F to G, being wood of the previous season's growth, show a few bloom buds, and are capable of producing fruit. Sometimes on wood similar to that from C to D the short spurs, instead of being abortive, carry bloom buds, and such wood may be retained for another season if required.

The laterals in 3 and 4 of Figure 25 are from the inside of the tree represented in Figure 23, situated low down in the tree. They are devoid of bloom buds, and the top portion of 4 is dead. These growths are useless, and should be removed when pruning. Their condition is due to lack of air and sunlight, which are essential to healthy growth, the light enabling the leaf to obtain carbon from the air. One has only to imagine this tree in full foliage to realise that twigs situated low down, and growing towards the centre, would not receive their full share of light and air. By thinning out the tree, as shown in Fig. 24, abundance of light and air will penetrate to the inside of the tree, and new laterals growing there will remain healthy, and mature their buds as well as those growing on the outside.

Fig. 25.

1. Lateral carrying bloom buds and wood buds.
2. Lateral which should have been removed after fruiting.
3 and 4. Useless laterals which should be removed when pruning.

Figure 26 shows a leader before receiving its third pruning, and Figure 27 the same leader pruned. The stronger branching limb was

Fig 26. Pullars Cling, showing leader before its third pruning.

removed, as its position was too upright; whereas the weaker one retained was in the correct position.

The tree (Fig. 24), after its third pruning, is a well-shaped, well-grown tree, capable of carrying an increasing amount of fruit for some

years, and the subsequent pruning will consist in the removal of badly-placed strong growths and the thinning out of the laterals. Laterals which have borne fruit in the summer should, as a rule, be removed. They should be cut off at their junction with the leader if basal buds have developed on the leader at this point. If there are no buds at the

Fig, 27.—Same tree as in Fig. 26, showing same leader pruned.

junction of the lateral and the leader, cut the lateral off at the nearest well-developed bud to the leader. New laterals should also be thinned out sufficiently to allow plenty of new wood for the crop in the following year. The leaders should be cut to a lateral near the top, so as to

continue the spread of the tree, and any strong ones near the one retained should be removed. Only laterals showing bloom buds should be retained.

Frequently a strong lateral is bent down by the weight of its fruit, and this restricts the sap flow, with the result that one or more wood buds near its base are forced into growth, and form sub-laterals. In

Fig. 28.—Comet Peach (6 years old)—pruned to carry a full crop of fruit.

this case the pruning consists in removing the old lateral back to one of the sub-laterals, retaining the latter for fruiting.

Shortly the object of the pruner, after the tree has been properly shaped and reached the bearing stage, should be to renew the lateral growths along each leader annually, removing the laterals which have borne fruit and retaining sufficient new ones to carry an adequate crop

in the coming season. Where trees are lacking in vigour more severe pruning of the leaders will be required than has been described. Under conditions where the growth is comparatively slow the leaders should be cut so as to remove about a third of their length for two or three years, or until a strong frame-work has been formed capable of sustaining the weight of fruit when the tree is in bearing.

Fig. 29.—Another tree, unpruned.
(Compare with tree shown in Fig. 28. Note how heavily the one has been thinned out.)

One of the most frequent mistakes made in pruning the peach is to leave far too many laterals. The result is a heavy crop of fruit of small size and poor quality. This causes a heavy drain on the tree's vitality, as it is the number of kernels formed which exhaust the tree, and not

the weight of fruit. Besides this, comparatively few new laterals will have formed, so that the ensuing crop will be poor.

Figure 28 shows a six-year old Comet peach tree pruned to carry a full crop of fruit. A comparison with Figure 29, an adjoining tree, indicates how heavily the former has been thinned out.

Another common error is to have the leaders placed too close together. The number of leaders in a full grown tree will vary with the spread of the tree, but not more than ten or twelve are necessary. The newly planted tree is started with three leaders, increased to four in the second year, from six to eight in the third year, and from eight to twelve in the fourth, the number retained depending on the size of the tree. New leaders should be chosen so as to keep the spaces between them as even as possible.

Fig. 30.—Lateral of Zerbe's Early, overcrowded with small fruit.

When the tree become enfeebled by age or root trouble, pruning should become more severe. The leaders should be cut to laterals lower down than formerly, so as to reduce the height of the whole tree. At this stage the grower has to fight for growth by more severe pruning and heavy manuring, as well as general attention to watering and cultivation, otherwise the fruit will not reach its full size, and crops will become scanty. Eventually, when the tree fails to respond to such treatment, it should be removed.

From the fourth year of the tree's life, assuming normally vigorous growth, it may be expected to give annually increasing crops for several years, but unless the soil be exceptionally rich, food must be added to

keep up with the increasing demands on the soil made by the roots, and when pruning the number of fruiting laterals left should be regulated by the richness of the soil. In other words, the pruning should work in with the manuring and tillage operations. A severe thinning of the laterals is wasteful if the tree be very vigorous and growing on heavily manured and well cultivated soil, but is essential if weak from lack of manure or cultivation.

In many orchards trees become bare of fruiting wood in the lower portions, and as the trees increase in age, this becomes more pronounced. This is generally due to too severe cutting of the leaders and allowing too many leaders to remain. The effect of this treatment is that the sap has too free an access to the top of the tree, and consequently the lower portions are starved. In addition to this, the heavy top growth causes a dense shade, so that any laterals which form low down in the tree, die out for lack of light and air. By light pruning of the tops and thinning out of the upper portion of the tree the sap is dammed back, and keeps on forcing out new laterals throughtout the length of the limbs.

Trees which have become barren in the lower portions through incorrect treatment or neglect may be refurnished by severe pruning of the leaders. These should not be pruned to bare stumps, but cut to a lateral growth as low down on the limb as possible. If the roots be healthy, and the trees receive good cultural treatment, a number of strong shoots will break out along the length of the old limbs. The strongest and best placed of these should be selected and pruned so as to form a new framework, and other strong growths removed. Light lateral growths should be retained to carry fruit and assist in the tree's growth.

Some varieties of peaches, notably Brigg's Red May and Hale's Early, and to a lesser extent, Early Crawford and Reine de Verges, have a habit of dropping their bloom buds in the winter and early spring. This is most pronounced on free soils. The pruning of these varieties after they have reached the bearing stage should be left until the blooms have partially opened, as the pruner is then able to see which laterals have retained their blooms, and are therefore capable of bearing fruit.

The short laterals, about six inches or less in length, are generally the best on these trees, as the bloom bud at the apex almost invariably remain. This dropping of the bloom buds is characteristic of the varieties mentioned, and no method of preventing it is known to the writer.

In a season when peaches set heavily, although the trees may have had the laterals well thinned out, there may be an excess of fruit, and it will be necessary to supplement the pruning by thinning out the fruit itself.

This should be done before the stones have formed, otherwise the tree will be much debilitated and the fruit undersized. The peaches should be spaced about four inches apart along the lateral, and those near the end of long laterals removed for preference, as they are usually smaller than those further back. This work is especially necessary for dessert varieties, which are of little value if undersized. Some of this work may be obviated by shortening very long laterals when pruning. Figure 30 is a photograph showing a lateral of Zerbe's Early peach carrying an excessive number of small peaches.

(To be continued.)

FRIESIAN CATTLE IN VICTORIA.

By J. S. McFadzean, Senior Dairy Supervisor.

From a point of view possibly not recognised by those handling the breed, Friesian cattle appear likely to fill a very definite part in the advancement of the dairying industry in Victoria, viz., in regard to demonstrating the value of feeding dairy cattle liberally. Coming into the Government herd-tests two years since, these cattle at once attracted much attention through their heavy milk yields, which is the special feature of the breed.

Until about five years ago this breed was called the "Holstein-Friesian," and the first portion of this name was more generally used when speaking of them; but this has now been dropped, and Friesian is almost universally recognised as the correct name of the breed. They are big-framed stock; those in this State are black and white in colour, the marking being in large patches rather than in spots, and a tinge of brown runs through the black. The head and jaws are more frequently black than white, but there is generally a white spot on the forehead or strip down the face; while the belly, shanks, and switch of the tail are usually white. The horns are small and fine in quality, curving slightly inwards to the front over the forehead. The heavy milkers are usually somewhat spare in flesh and show true dairy type, but other cows frequently run to coarseness, particularly in the shoulder and thigh. When handled quietly they are just as docile and tractable as cattle of any of the other dairy breeds.

This breed was first brought into Victoria from New Zealand in 1886, by the late Mr. Frederick Peppin, then of Epping, and later of Loch. His importation was of stock actually bred in Holland, whence they had then been but recently imported by Mr. Grigg, of Longbeach, New Zealand, when Mr. Peppin managed to secure some of them. The bulls of this shipment, "Taureau," and his son "Taureau 2nd," appear in many of the pedigrees of the present day Victorian-bred Friesians, Taureau being a Dutch Friesian Stud Book animal, and was on exhibition at the National Show in Hamburg when purchased by Mr. Grigg.

The high dairy quality of this Dutch-bred stock was well in evidence even at that time, for at the Melbourne show in 1887 Mr. Peppin's cow, "Dairymaid" imp., gave 128 lbs. of milk in a two days' test, which churned 4 lbs. 11¾ ozs. of butter; and she won the Champion Dairy Prize in a similar competition in 1888 by giving 117 lbs. of milk and 3 lbs. 1¾ ozs. of butter.

The whole of Mr. Peppin's stud of Friesians was sold to the late Mr. David Mitchell, of Cave Hill, Lilydale, in 1892, and amongst the nine cows specially mentioned in the record of that sale were three of Mr. Peppin's original importation. Mr. Mitchell bred largely from this foundation, using the stock in his "Cave Hill" dairy herd, and adding to the stud at various times other breeding animals purchased in South Australia and New South Wales. Also more recently a Canadian-bred bull from a specially selected heavy milking cow was bought from Mr. O. J. Syme's herd for this stud, which is still maintained in considerable numbers.

The Killara stud of the late Mr. David Syme, was also founded by stock purchased in New Zealand, and later on carried much of the

1. Dominion Homestead Maggie. **2. Dominion Iona.** **3. Dominion Violet Fobes.** **4. Holland Lass II.**
The property of Messrs. Flack and Sewell. The farm records show that each of these cows gave over seven gallons daily last spring.

same blood as the Cave Hill herd. On Killara, which is on the rich Yarra Flats country above Lilydale, under the management of Mr. O. J. Syme, over a hundred head of these black and white cattle were milked for many years; and on the dispersal of this herd following on his father's death, Mr. O. J. Syme established a Friesian stud at "Bolobek," Macedon, with stock purchased at the Killara clearing sale. In 1912 Mr. Syme imported two bulls, one cow, and six heifers from prominent Canadian studs, shortly afterwards selling out the whole of his big dairy herd of the original stock, and retaining only those from Canada. Following this he made two further importations from New Zealand, of eight head and four head respectively, and these 21 imported cattle were the foundation of the present Bolobek Friesian stud, which is still one of the largest in the State.

These Bolobek cattle have won many prizes in the Melbourne Royal Show ring, and their records in the Government herd-tests during the past two years show that in dairy quality also they are fully representative of the breed. During the year 1918-1919 the seven matured

The Department of Agriculture's Bull, Victoria Milkman Jo.

cows in this stud averaged 934 gallons of milk and 347 lbs. of butter fat in the 273 days; the four second-calf cows averaged 991 gallons of milk and 365 lbs. of butter fat; the three heifers averaged 802 gallons of milk and 328 lbs. of butter fat; one of these heifers, "Bolobek Aaggie," giving 958 gallons of milk and 417 lbs. of butter fat in the nine months' test. Again in the 1919-1920 test, the 14 matured cows averaged 1,059 gallons of milk and 383 lbs. of butter fat; the three second-calf cows averaged 1,141 gallons of milk and 429 lbs. of butter fat, the top cow in this section, "Bolobek Aaggie," giving the splendid yield of 1,266 gallons of milk and 429 lbs. of butter fat in the 273 days, and heading the list of four-year-olds against all breeds. At the completion of this official test "Bolobek Aaggie" was still giving 33 lbs. of milk daily, and the farm record sheet shows that she milked for 52 days more before her next freshening, giving altogether 1,366

Department of Agriculture's "Dominion Belle Corona."
(Born 28.1.14.)

1st Calf (2.11.18), 731 gallons of milk, 304 lbs. butter fat, in 273 days.
2nd Calf (21.9.19), 1,164 gallons of milk, 420 lbs. butter fat, in 273 days.
3rd Calf (29.9.20), now under test.

Department of Agriculture's "Dominion Hyacinth."
(Born 3.9.15.)

1st Calf (29.8.19), 1,142 gallons of milk, 448 lbs. butter fat, in 273 days.
2nd Calf (1.12.19) 1,151 gallons of milk, 479 lbs. butter fat, in 273 days.
3rd Calf (16.2.21), now under test.

gallons of milk in 325 days, or an average of over 4 gallons of milk per day for the whole milking period on this second calving.

A small Friesian stud has been for several years in the Ballarat district, where they also have a good reputation as milkers. These stock run back to the Cave Hill cattle through the present owners, Messrs. Dickinson Bros., of Sebastopol, buying from Mr. Ibbott, of Potilla, who at that time had his stud at Benalla and was using Cave Hill cows with a bull purchased from Mr. Porter, of Victor Harbour, South Australia. Messrs. Dickinson Bros. have now six head in the Government test, and last year one of these, a heifer on her first calf, gave 1,020 gallons of milk and 368 lbs. of butter fat in the 273 days.

The cattle with which Mr. A. W. Jones started his "St. Alban's" Friesian stud at Geelong also came from South Australia, a bull and two heifers being purchased from Mrs. Burdett, of Bolivar, South Australia, in 1915. In 1917 the bulk of Mr. Dickinson's herd were bought; and in 1918 four heifers from Mr. O. J. Syme, and since then

Princess Ena (imp.)—Mr. O. J. Syme.

1st Test, 1,044 gallons of milk, 384 lbs. butter fat, in 273 days.
2nd Test, 1,144 gallons of milk, 441 lbs. butter fat, in 273 days.
3rd Test, 1,167 gallons of milk, 424 lbs. butter fat, in 273 days.

the St. Alban's breeder has imported several head of New Zealand cattle. Mr. Jones has a very fine dairying property on the Barwon River, at Geelong, where, under irrigation, he grows both lucerne and maize in quantity for stock feeding; and in the 1919-1920 test his herd of eleven Friesians was second on the list of all breeds for high butter-fat production. In the previous year, the winning four-year-old cow, May Queen II., was from this herd, her record standing at 1,131 gallons of milk and 519 lbs. of butter fat; last year, as an aged cow, May Queen II. was third on the list of all breeds with 616 lbs. of butter fat, and top cow of all breeds in milk production with 1,297 gallons in the

273 days. This is an average of 48 lbs. of milk per day for the whole of the test; and she was still giving 36 lbs. of milk per day when that nine months' test closed. The five matured St. Albans' cows which completed this 273 days' test last year put up the fine record of 1,153 gallons of milk and 456 lbs. of butter fat, averaging over 23 lbs. of milk per head per day when the test closed.

Comparatively recently, Messrs. Flack and Sewell have established a stud of Friesians at "Burbank," near Berwick, with young imported cattle. The only matured cow in last year's test gave 1,254 gallons of milk and 466 lbs. of butter fat, with 34 lbs. of milk on the last day of the test; one of the heifers gave 1,029 gallons of milk, and 352 lbs. of butter fat, finishing the 273 days' test with 27 lbs. of milk for the day. The cattle from this "Burbank" stud have also done exceptionally well in both the Melbourne and Sydney Royal Show rings.

The Department of Agriculture has two small Friesian herds, one at the Burnley Gardens, Richmond, and the other at the Research Farm, Werribee, all of New Zealand breeding. These cattle have some excellent dairy records, as well as good show-ring performances, for during last year's test the six matured cows averaged 1,119 gallons of milk and 425 lbs. of butter fat, while the whole ten head of all ages averaged 1,065 gallons of milk and 393 lbs. of butter fat.

Those who have studied the various yields of the different breeds of cattle in the Government herd-tests, will recognise that these big milking records of the Friesians are of high importance to the dairying industry. Thereby they have raised considerably the maximum gallon yield given by any herd of cows in these tests, setting a new standard for that most important section of dairy production, viz., the bulk milk yield; and at the same time their performance draws special attention to the importance of heavy feeding in good dairy management.

Butter-fat yield has long been the accepted standard of dairy excellence the world over; and the Friesian Club of Australia at its first meeting in Sydney, in March last, recognised this by fixing the qualification for its "Advanced Register" as a yield of 400 lbs. of commercial butter in 273 days; nevertheless, bulk yield of milk has always been a big consideration in dairy work. The advancement made in the manufacture of the by-products of the butter factory, such as casein and dried milk, is also still further upholding the value of the cow which gives a heavy milk flow. Prior to the advent of the Friesians, the Ayrshires held the top place in these tests with a herd average of 865 gallons of milk from 28 cows in 273 days; but the 55 Friesians have topped this with a 965 gallons average in the same period, one herd of nineteen cows and heifers averaging 1,030 gallons.

The 55 Friesians in the 1919-1920 test averaged 3.8 per cent. of butter fat for the whole of the nine months' term, which gives a sufficient margin above the Board of Health standard to allow of its being a satisfactory milk to handle for the retail trade, providing a herd is not composed of all newly-calved cows. As all cows improve somewhat in the quality of their milk when well advanced in their milking period, and falling off in their daily quantity, a proportion of these so-called "stale" cows in each herd insures the bulk quantity of almost any milk being up to standard quality; and, as long as dairymen who keep extra-heavy milking cattle, have a mixed herd of "stale" and "fresh" cows, they are reasonably certain of the milk being of the required butter-fat content.

Department of Agriculture's Madrigal (now dead).
11,373 lbs. of milk, 447 lbs. butter fat, in 1918–19 Test (273 days).

Rock Patch (as a yearling).

With many dairymen the cow which gives the heaviest bulk yield of milk will always be in great demand, more especially if the flow is well sustained up to the next freshening. That the Friesian can also do this is shown in their averaging a yield of 2 gallons of milk per cow per day at the completion of their nine months' test. Here then are three principal requirements for the city milk trade possessed by Friesian cattle, viz., a heavy milk yield, a well-sustained flow, and a milk of a quality which leaves a fair working margin above the Board of Health standard.

Certainly the number of Friesians yet being tested—only 55 out of a total of 570 head of all breeds last year—leaves this comparison of their bulk milk yields with those of other breeds anything but equable; and it cannot be taken as a definite indication of what the average production will be when the breed is tested in larger numbers. Yet the fact that 55 Friesians have actually made this big average milk yield must be taken as proof of the capabilities of the breed; for it is certain that by systematic breeding, culling, and feeding, this average could be maintained. It might be even largely increased, for the Victorian climate leaves little to be desired in the way of conducing to heavy dairy production; but it is through the lack of proper feeding, rather than any other cause, that any future reduction of the average gallon yield is likely to arise.

Feeding is the basis of all dairy production, and the Friesian, being a big-framed animal, requires a big bulk of feed as a maintenance ration, as well as concentrates to enable her to produce as heavily as she is capable of. At present those who are handling this breed are doing well by their cattle, and giving them the opportunity to show what they are capable of. In the hands of the large wholesale milk suppliers these same good feeding conditions would also be provided, as those men invariably see to the heavy feeding of their cattle. A shortening of the milk flow always calls for the purchase of more cows, which also means more labour and feed to produce the required quantity. With them, big yielding cows which hold well to their milk, are the most profitable; and it pays the owners to feed them to their utmost producing capacity. It is to such men that these big Friesian yields are certain to appeal.

Under heavy feeding most cows hold well to their condition, and if they are bred for dairy work they will then milk almost continuously, and make big profit for their owner. But the fact stands that many Victorian dairymen are most indifferent in regard to the proper feeding of their cows; and this, more than the lack of dairy quality, is largely responsible for the low average production of Victorian dairy cattle. In every district in the State there are very few herds in which the average yield could not be largely increased by keeping the cows well supplied with either green feed or silage alone, without the buying of any concentrates, which, of course, would still further improve the milk supply.

Not only to the wholesale milk supplier, but to every dairyman, there is big profit in feeding cows liberally; and more especially if the bulk of the fodder is grown on the farm. With their average of 965 gallons of milk in 273 days (and many of them were still giving over 3 gallons per day when the test closed), these Friesians have set a much higher value on heavy feeding than there ever was before. The study of these gallons is a complete answer to the question of whether it will pay to feed cows all they will eat. Our Friesian breeders have shown that there is not merely a living, but big profit coming to the dairyman who keeps heavy milking cows and feeds them well.

COMPARATIVE COSTS OF PRODUCTION OF OATS FOR GRAIN AND HAY ON STUBBLE AND FALLOW LAND.

STATE RESEARCH FARM, WERRIBEE.

By H. C. Wilson, Manager, State Research Farm, Werribee.

It is generally admitted that for the successful and economical production of wheat in the wheat belt of Victoria the crop should be preceded by a well-worked moisture-saving fallow. With oats and hay, on the other hand, it is assumed that profitable crops can be grown on land which has not been fallowed. This latter assumption is held to be particularly true when the season is either normal or above the average in rainfall. Growers may concede that in dry years it is essential that oats and hay should be sown on fallow, but in seasons of good rainfall, they contend, these crops grown on stubble land can be produced profitably.

The experience at the State Research Farm during the past year shows that oats and hay can be grown at much less cost per bushel and per ton, respectively, on fallowed land than on stubble or green ploughed land.

Last year (1920) the rainfall was 21.69 inches, which is about 2.14 inches above the average, and even under these conditions oats and hay grown on well-prepared bare fallow show a lesser cost of production per unit than these crops grown on stubble land.

Two bulk fields were taken last season to test these comparative costs—a fallow field of 90 acres and an adjoining stubble field of 108 acres of similar soil. One-half of the fallow field was sown with oats for hay, and the other half with oats for grain. The stubble land was cropped with oats for hay and for grain. The treatment of these fields in the past was as follows:—Since 1914 the fallow field has produced wheat after fallow in alternate years. The other field has been sown in a three-course rotation of first year fallow, second year shandy hay (Warden wheat and Algerian oats), and third year oats.

The main point which it is desired to stress is that even in a favorable year such as 1920, when the rainfall during the growing period was considerably above the average, and when it might be expected that stubble land would be particularly responsive to a practice of this kind, the cost of production per unit was much less on fallow land, as is shown by a perusal of the statement of costs below.

In determining these costs of production every charge has been allowed for, and the figures represent the actual costs for the past year. In each item consideration has been given to interest on outlay, depreciation in teams and implements used, and overhead charges; whilst workmen have been paid the ruling rate of wages in the district during the year.

The following table gives a summary of costs of production of oats grown for hay on fallow and stubble land, respectively:—

TABLE I.—COMPARATIVE COSTS OF PRODUCTION PER ACRE FOR OATEN HAY, GROWN ON FALLOW AND STUBBLE LAND RESPECTIVELY, AT THE CENTRAL RESEARCH FARM, WERRIBEE, 1920-21.

	Oaten Hay after Barefallow, per acre.* s. d.		Oaten Hay after Stubble, per acre.* s. d.
1. Rent of Land (18 months) ..	18 0	(9 months)	9 0
2. Cultivation Expenses—			
Ploughing	10 0	Ploughing	10 0
Cultivation (twice) disc ..	5 10	Cultivation, with disc, once ..	2 11
Harrowing (twice) ..	1 10	Harrowing and rolling ..	2 0
		Harrowing and rolling (after seeding)	2 0
Drilling	2 5	Drilling	2 5
Rolled, after drilling ..	1 1	Rolled, after drilling ..	1 1
Seed, 1½ bushels, at 6s. 8d. per bushel	10 0	Seed, 1½ bushels oats, at 6s. 8d. per bushel	10 0
Super., 1 cwt., on ground ..	6 0	Super., 1½ cwt.	9 0
3. Harvesting Expenses—			
Cut with binder	8 0	Cut with binder	6 3
Binder twine	4 0	Binder twine	3 0
Stooking	5 8	Stooking	4 1
Carting and stacking ..	13 3	Carting and stacking ..	11 0
Insurance and thatching ..	3 0	Insurance and thatching ..	1 11
	89 1		74 8
Yield, 61 cwt. Cost per ton, 29s. 3d.		Yield, 38 cwt. Cost per ton, 39s 3d.	

* The value of land is £10 per acre—rental value, 12s. per acre. In case of fallow, 18 months was charged against the hay crop. With stubble, 9 months' rent was charged, balance of 6 months and 3 months being credited to stock account.

It will be apparent from a perusal of the above table of costs that the total cost of production per acre on the fallow land was £4 9s. 1d., as compared with £3 14s. 8d. with the stubble land. The principal factors responsible for this increase were (1) increased rental charges (18 months as compared with 9 months for stubble land), (2) increased cost of handling the larger tonnage per acre during harvest.

The yield per acre is the principal factor in determining the cost per ton. The yield per acre in the case of the fallowed land was 61 cwt., as compared with 38 cwt. in the case of the stubble land, which made the cost of production on the fallow land only 29s. 3d. per ton, as compared with 39s. 3d. on stubble land.

The present price of hay in stack at Werribee is about £2 10s. per ton (for prime hay). This shows a margin above the cost of production of 10s. 9d. per ton in the case of the stubble-grown crop, and 20s. 9d. per ton for the fallow-grown crop.

The margin per acre, however, over the cost of production shows an even greater disparity in favour of the fallow land, being 60s. 5½d., as compared with 20s. 5½d. in the case of stubble land.

The profit per ton in any one season will, of course, be dependent on the selling price of the hay. The profit per acre will be dependent primarily on the tonnage per acre. Hence the comparative net returns from these two methods of production can be shown in the form of a table where arbitrary prices are assumed for hay:—

TABLE II.—SHOWING MARGIN OF PROFIT OVER COST OF PRODUCTION OF OATEN HAY GROWN ON STUBBLE AND FALLOW LAND AT THE CENTRAL RESEARCH FARM, WERRIBEE, WITH HAY AT VARYING PRICES.

Price of Hay.	Margin of profit per ton over cost of production.		Margin of profit per acre over cost of production.	
	Stubble land.	Fallow land.	Stubble land.	Fallow land.
s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
40 0	0 9	10 9	1 5	29 5
45 0	5 9	15 9	10 11	44 11
Present season's price **50 0**	**10 9**	**20 9**	**20 5**	**60 5**
55 0	15 9	25 9	29 11	75 11
60 0	20 9	30 9	39 5	91 5
70 0	30 9	40 9	58 5	122 5
80 0	40 9	50 9	77 5	153 5
90 0	50 9	60 9	96 5	184 5
100 0	60 9	70 9	115 5	215 5

From what has been said above, it will be apparent that the cost of production per ton, even in most favorable years, such as 1920, and under the best farming methods, will not be less than 30s. per ton, stacked on the ground where produced; but in unfavorable seasons, and with faulty farming methods, the cost per ton may be greatly increased.

II.—Oats for Grain.

As has been explained above, the fields which were used for these tests were portion of those devoted to the production of oaten hay. The portions of the fields devoted to the production of grain were cut with the binder and stooked in the same way, and at the same cost of production, as with oaten hay. The varying costs occurred only when the crop was threshed direct from the stook. The following table summarizes the cost of production per acre and per bushel:—

TABLE III.—SHOWING COMPARATIVE COSTS OF PRODUCTION PER ACRE OF OATS FOR GRAIN ON FALLOW AND STUBBLE LAND RESPECTIVELY, AT STATE RESEARCH FARM, WERRIBEE, 1920.

	Fallow Land. £ s. d.		Stubble Land. £ s. d.
1. Rent on land, 18 months, at 12s. per acre per annum	0 18 0	9 months	0 9 0
2. Cultivation Expenses, including seed and manure (per acre)	1 17 2		1 19 5
3. Harvesting Expenses—			
Cut with binder (per acre)	0 8 0		0 6 3
Binder twine (per acre)	0 4 0		0 3 0
Stooking	0 5 8		0 4 1
Threshing Expenses, out of stook—			
Heavy crop, at £5 10s. per 100 bags (4.4d. per bushel)	1 2 10½	Lighter crop, at £6 10s. per 100 bags (5.2d. per bushel)	0 16 5½
4. Carting oats to shed, and insurance	0 5 2		0 3 2
5. Cost of standard sacks, 2nd hand (9s. per doz.)	0 15 0		0 9 9
Total cost per acre	5 15 10½	Total cost per acre	4 11 1½
FALLOW LAND CROP.		STUBBLE LAND CROP.	
*Present straw value, 30s. per ton in stacks on farm as left by thresher (35 cwts. per acre)	2 12 6	22 cwts. per acre	1 13 0
Net cost per acre of oats	3 3 4½	Total cost per acre of oats	2 18 1½
Yield per acre on fallow	62·4 bushels	Yield on stubble, per acre	38 bushels
Cost of production of oats per bushel	12⅛d.	Oats on stubble, cost per bushel	16⅛d.

* The value of straw in stacks on the farm will, of course, vary in accordance with the market demand, and the distance from the centre of sale. The above figures are the actual prices obtained this year for the straw from these areas, which has now been pressed and marketed.

The cost of production of oats for grain on fallow and stubble land is £3 3s. 4½d. and £2 18s. 1½d. per acre respectively. After allowing for the net proceeds of the straw sale, these figures, reduced to actual cost per bushel, work out at 1s. 0⅛d. and 1s. 4⅛d. respectively in store.

Therefore it will be seen, by a study of the above figures, that it is much more profitable to produce oats for grain on well-worked fallow land than on stubble land, and this even in a season of good rainfall, when the stubble land has the advantage.

It must be pointed out that while the cultivation expenses and rent of land will remain practically the same as the above in a normal year of average rainfall, the harvesting costs will be dependent on the size and yield of the crops, and the weather experienced immediately before and during harvesting operations.

The above figures show that oats for grain in favorable years, and under approved farming methods, will cost to produce approximately 1s. per bushel, but this cannot be taken as an average cost of production for this crop in Victoria. The method of harvesting at Werribee, whereby the straw becomes a considerable asset, reduces the cost of production to a very large extent; but the predominant factor in reduction of costs is efficient farming methods, with resultant high yields.

TYPE: AND THE BURNLEY COMPETITION.

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(Continued from page 694, Vol. xviii.)

The Leghorn Fowl.

Poultry-keeping has been known to exist in Italy for hundreds of years, and is referred to in the early writings of Cicero, Pliny, and others. It is known also that Cæsar took fowls along with his conquering armies, introducing certain varieties at the time of his invasion into Great Britain. The Leghorn fowl was the common fowl of Italy, and was introduced into America some 80 or 90 years ago, and somewhat later Mr. W. B. Tegetmeier imported Leghorns into Great Britain, the Leghorn Club, established in 1876, being the first specialist club. It is also known that the White Leghorn was crossed with the White Minorca to obtain greater purity of colour, and possibly also to increase size of egg. The hardiness of the breed is undoubted, as is proved by their laying qualities in the cold of North America, the variable climate of Great Britain, and the heat of Queensland. The Poultry Club standard calls for the following points:—

General Characteristics of the Male Leghorn.

Head and Neck.—*Beak:* Stout, the point standing well clear of the front of the comb. *Comb:* Fine in texture, large but not overgrown, single, perfectly straight and erect, deeply and evenly serrated, the spikes broadening at the base; extending well beyond the back of the head and following, without touching, the lines of the hackle; free from thumb marks and side sprigs. *Face:* Fine in texture, and free from wrinkles or folds. *Wattles:* Long, thin, and fine in texture. *Lobes:* Well developed and rather pendant, equally matched in size and shape, smooth, open, and free from folds. *Neck:* Well arched and full in hackle.

Body.—*Body:* Wedge shaped, wide at shoulders, and narrowing to the root of the tail. *Breast:* Round and prominent, the breast bone straight. *Back:* Slightly rounded and sloping to the tail. *Wings:* Large, carried well clipped up.

Tail.—Moderately full carried at an angle of 40 degrees to 45 degrees.

Legs and Feet.—*Legs:* Long, the shanks free from feathers. *Feet:* Well spread, the toes long and straight.

Carriage.—Upright.

Size.—Medium, rather large to be preferred, consistently with symmetry and type.

General Characteristics of the Female Leghorn.

Head and Neck.—*Beak, Wattles, Face, Lobes,* and *Neck:* As in the male bird. *Comb:* Fine in texture, large but not overgrown, single, deep and evenly serrated, free from side sprigs, rising from a firm base and falling gracefully over to either side of face.

Body.—*Body:* Wide at shoulders, and narrowing slightly to the tail, longer and not carried so upright as in the cock. *Breast:* Round, very full, and nicely curved from the neck. *Back:* Long, fairly broad, and but slightly rounded.

Tail.—Fairly long, and moderately full, but carried closely, and at a slightly lower angle than the male bird.
Legs and Feet.—As in the male bird.
Carriage.—Description of male bird applies.
Size.—As in the male bird.

There is absolutely nothing in the foregoing standard that is opposed to egg-laying, the natural characteristics of this bird. A full, round breast is desired in both sexes, and this is indication of robust constitution and crop capacity. No reference is made to the number of points, or serrations, in the comb, which should, however, be five in number. One of the features in the comb of the female is that the front and first point should stand erect, while the remainder lops over. In the Minorca the whole comb lies flat on the head and side of the face following the back of the neck. The desired weights are 5½ to 7 lbs. for adult males, and 4½ to 5½ lbs. for hens. Close in-breeding where insufficient rearing ground is available, and the low grade of wheat that has had to be used for the past few years by poultry farmers have resulted in some slight degeneracy, which has been further accentuated by an occasional lack of masculinity in the male bird. A pullet-headed male will injure the flock just as surely as will a coarse-headed male.

In the last Burnley Competition there was a marked lack of stamina in the White Leghorns, a number of the birds being rather undersized, too light and fine in head, and deficient in breast. One fault, however, is yearly becoming less noticeable, that is, white face. This could almost invariably be traced to a well-known heavy-laying strain, which was popularly supposed to have had some foreign blood introduced. According to the standard, *serious defects*, for which a bird should be passed, are: Male comb twisted, or falling over, or female's comb erect; ear lobe red; any white in face; any colour but yellow or orange; wry or squirrel tails, or any bodily deformity. The world's record for a team of six birds for one year is held by Mr. W. N. O'Mullane's White Leghorns, which laid 1,699 eggs at Burnley Competition, fed on dry mash.

The Ancona.

Mr. Edward Brown, in *Races of Domestic Poultry*, states that Mr. Harrison Weir observed Anconas in Great Britain in 1851, and ten years later they were exhibited at Birmingham Show. In the earlier editions of Mr. Lewis Wright's *Book of Poultry* it is suggested that the origin of the Ancona is found in accidental sports of this colour by crossing black and white Minorcas, but in the edition published in 1902 it is acknowledged that the earlier birds were mottled Leghorns. The Ancona Club was founded in 1898, and Mr. Brown states: "Unfortunately this club passed into the control of fanciers who cared little for the economic qualities, and who were ready to sacrifice the latter in order to secure perfect external characters, Mr. E. Cobb stating in the *Feathered World*, 7th October, 1898, that the profits accruing by breeding a bird that can win a pocketful of money in the season are far greater than a basketful of eggs at a penny a piece. The changes adopted by the Ancona Club have been from the exhibition point of view, and were it not that there are many breeders who adhere to the older type, and have refused to improve external characters at the expense of economic qualities, but have kept the latter to the fore, the breed would be of smaller use as an egg producer. Such divergencies

have retarded the popularity of the breed, and purchasers of mere exhibition stock have found they have lacked the vigour and prolificacy expected."

Moreover, crossing with the Minorca has been resorted to, in order to enhance size of body and of comb; also to fix the white ear lobe, which Mr. Brown does not think should be found in the Ancona.

INVESTIGATION OF ANIMAL DISEASES AT THE UNIVERSITY VETERINARY SCHOOL.

In 1916 the Walter and Eliza Hall trustees established a Fellowship in Veterinary Science, tenable at the University Veterinary School, Melbourne, to enable research work to be carried out with regard to diseases of animals in Australia.

Mr. Gerald Hill, F.E.S., now entomologist of the Australian Institute of Tropical Medicine at Townsville, was the first Fellow appointed. During his tenure of the Fellowship he conducted a series of experiments to discover the life history of three nematode worms commonly parasitic in the stomach of horses. These parasites are very common in Victoria, and not infrequently are the cause of fatal disease by puncturing the wall of the stomach, resulting in abscess formation in the spleen or even peritonitis. As a result of his work he proved that the larvæ of these worms are carried by the common house fly (*musca domestica*) and the stable fly (*stomoxys calcitrans*), and by this means from horse to horse.

Mr. Hill also cleared up several points regarding the life history of the sheep louse fly (commonly known as the sheep "tick" or "ked"), and determined the length of time that this parasite can live on the ground and undergrowth, away from the sheep.

These determinations are of considerable value in showing that the chances of re-infection of sheep after dipping, from grass, bushes, or soil of the pastures are very remote.

Following Mr. Hill, Major G. G. Heslop, D.S.O., M.V.Sc., D.V.H., held the Fellowship, and conducted research into the diagnosis of contagious bovine pleuro-pneumonia by an examination of the blood of affected cattle. As a result of Mr. Heslop's work it is now possible, even in the absence of clinical signs, to determine whether a beast is infected with pleuro-pneumonia, by testing the blood of the suspect by a method comparable to the Wassermann re-action used in syphilis. Pleuro-pneumonia is present in Victoria, and is causing considerable loss to stock-owners; and the value of detecting newly-infected cattle and carriers of the disease, so that control can be made more effective, is inestimable.

This year the Fellowship is being held by Mr. H. E. Albiston, M.V.Sc., who is investigating the two diseases of sheep common amongst Victorian stock, namely, lung-worm and braxy. Sheep-owners who suspect the presence of either of these diseases amongst their flocks are asked to communicate in the first instance to Mr. W. A. N. Robertson, the Chief Veterinary Officer, Department of Agriculture, who will make arrangements for investigations to be made when thought necessary.

STALLION PARADES.

TIME TABLE, 1921.

Provided that the applications for registration received indicate that a horse will be in attendance there for examination, a parade will be held at each of the following places:—

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Every Saturday from 25th June to 24th December	Agricultural Offices	10 a.m.		
Tuesday, July 5	Goroke	3 p.m.	1.15 p.m.	7 p.m.
Wednesday, July 6	Horsham	9 a.m.	10.20 p.m. (5th)	4.35 p.m.
Thursday, July 7	Balmoral	10 a.m.	10.25 p.m. (6th)	Driving
Thursday, July 7	Toolondo	2 p.m.	Driving	Driving
Thursday, July 7	Natimuk	4 p.m.	Driving	10.10 a.m. (8th)
Monday, July 4	Ararat	3 p.m.	1.27 p.m.	4.35 p.m.
Tuesday, July 5	Navarre	9 a.m.	7.15 p.m. (4th)	10 a.m.
Tuesday, July 5	Rupanyup	4.40 p.m.	4.40 p.m.	5 p.m.
Wednesday, July 6	Marnoo	10 a.m.	6.5 p.m. (5th)	11 a.m.
Wednesday, July 6	Lubeck	1 p.m.	1 p.m.	1.43 p.m.
Wednesday, July 6	Stawell	2.45 p.m.	2.41 p.m.	9.8 p.m.
Thursday, July 7	Avoca	11 a.m.	8.20 a.m.	1.40 p.m.
Thursday, July 7	Ben Nevis	3.30 p.m.	3.26 p.m.	6.55 a.m.
Friday, July 8	Maryborough	11 a.m.	9.30 a.m.	12.33 p.m.
Friday, July 8	Dunolly	2 p.m.	1.46 p.m.	3.50 p.m.
Tuesday, July 5	Casterton	11 a.m.	7.55 p.m. (4th)	Driving
Tuesday, July 5	Coleraine	3 p.m.	Driving	8.30 a.m. (6th)
Wednesday, July 6	Harrow	12.30 p.m.	12.30 p.m.	1.45 p.m.
Wednesday, July 6	Edenhope	4.45 p.m.	4.45 p.m.	Driving
Tuesday, July 12	Dartmoor	11 a.m.	9 p.m. (11th)	9.55 a.m. (13th)
Wednesday, July 13	Heywood	11.45 a.m.	11.45 a.m.	12.15 p.m.
Wednesday, July 13	Portland	1.30 p.m.	1.5 p.m.	2.55 p.m.
Thursday, July 14	Branxholme	10 a.m.	5.25 p.m. (13th)	11.55 a.m.
Thursday, July 14	Dunkeld	1.30 p.m.	1.30 p.m.	3.53 p.m.
Thursday, July 14	Hamilton	4.33 p.m.	4.33 p.m.	Driving (15th)
Friday, July 15	Cavendish	10 a.m.	Driving	Driving
Friday, July 15	Melbourne	2.30 p.m.		
Tuesday, July 12	Ouyen	10 a.m.	5.51 a.m.	Driving
Tuesday, July 12	Walpeup	1.30 p.m.	Driving	Driving
Tuesday, July 12	Underbool	4 p.m.	Driving	Driving
Wednesday, July 13	Tutye	11 a.m.	Driving	Driving
Wednesday, July 13	Murrayville	3 p.m.	Driving	Driving
Thursday, July 14	Mildura	2 p.m.	8.40 a.m.	7.30 a.m. (15th)
Monday, July 18	Royal Show Grounds	10 a.m.		

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Tuesday, July 26 ..	Speed ..	10 a.m. ..	5.1 a.m. ..	10.56 a.m.
Tuesday, July 26 ..	Curyo ..	2 p.m. ..	12.29 p.m. ..	9.20 p.m.
Wednesday, July 27..	Woomelang	11 a.m. ..	10 p.m. (26th) ..	12 noon
Wednesday, July 27..	Watchem ..	3 p.m. ..	1.33 p.m. ..	7.27 p.m.
Thursday, July 28 ..	Birchip ..	11 a.m. ..	8.15 p.m. (27th)	1.5 p.m.
Monday, July 25 ..	Devenish ..	1 p.m. ..	12.31 p.m. ..	8.46 p.m.
Tuesday, July 26 ..	Tungamah ..	11 a.m. ..	9.31 p.m. (25th)	1.21 p.m.
Tuesday, July 26 ..	Yarrawonga	3.5 p.m. ..	2.5 p.m. ..	7.20 a.m. (27th)
Wednesday, July 27..	Benalla ..	10 a.m. ..	10 a.m. ..	11.25 a.m.
Wednesday, July 27..	Rutherglen	3 p.m. ..	1.53 p.m. ..	7.20 a.m. (28th)
Monday, July 25 ..	Macorna ..	3 p.m. ..	2.50 p.m. ..	9 35 p.m.
Tuesday, July 26 ..	Koondrook	9.30 a.m.	9.30 a.m. ..	10.30 a.m.
Tuesday, July 26 ..	Kerang ..	2 p.m. ..	11.30 a.m. ..	3 55 p.m.
Wednesday, July 27..	Swan Hill ..	10 a.m. ..	5.20 p.m. ..	Driving
Wednesday, July 27..	Ultima ..	1 p.m. ..	Driving ..	Driving
Wednesday, July 27..	Lalbert ..	3 p.m. ..	Driving ..	Driving
Thursday, July 28 ..	Piangil ..	10 a.m. ..	8.50 p.m. (27th)	Driving
Thursday, July 28 ..	Manangatang	1 p.m. ..	Driving ..	Driving
Thursday, July 28 ..	Chillingollah	3 p.m. ..	Driving ..	Driving
Tuesday, August 2 ..	Sea Lake ..	10 a.m. ..	9.20 p.m. (1st) ..	Driving
Tuesday, August 2 ..	Nandaly ..	12 noon ..	Driving ..	Driving
Tuesday, August 2 ..	Kulwin ..	3 p.m. ..	Driving ..	Driving
Wednesday, August 3	Culgoa ..	11 a.m. ..	9.54 a.m ..	9.54 a.m. (4th)
Thursday, August 4	Wycheproof	11.40 a.m.	11.40 a.m. ..	12.25 p.m.
Thursday, August 4	Charlton ..	3 p.m. ..	1.5 p.m. ..	1.22 p.m. (5th)
Monday, August 1 ..	St. Arnaud	3.30 p.m.	3.22 p.m. ..	12.14 a.m. (2nd)
Tuesday, August 2 ..	Donald ..	11 a.m. ..	1.22 a.m. ..	2.35 p.m.
Wednesday, August 3	Inglewood ..	11 a.m. ..	9.35 a.m. ..	1.32 p.m.
Wednesday, August 3	Boort ..	4.26 p.m.	4.26 p.m. ..	5 p.m.
Thursday, August 4 ..	Quambatook	10.30 a.m.	6.23 p.m. (3rd)	11.22 a.m.
Thursday, August 4 ..	Korong Vale	2.32 p.m...	2.32 p.m. ..	3.25 p.m.
Thursday, August 4 ..	Wedderburn Junction	3.39 p.m...	3.39 p.m. ..	3.39 p.m. (5th)
Tuesday, August 2 ..	Hopetoun ..	11 a.m. ..	9.20 p.m. (1st) ..	7.40 a.m. (3rd)
Wednesday, August 3	Warracknabeal	2 p.m. ..	10.30 a.m. ..	7.30 p.m.
Thursday, August 4 ..	Beulah ..	11 a.m. ..	8.55 p.m. (3rd)..	12.2 p.m.
Thursday, August 4 ..	Minyip ..	3.30 p.m.	3.18 p.m. ..	11.55 a.m. (5th)
Friday, August 5 ..	Murtoa ..	2 p.m. ..	12.30 p.m. ..	5.50 p.m.
Monday, August 8 ..	Tallangatta	4 p.m. ..	3.43 p.m. ..	Driving (9th)
Tuesday, August 9 ..	Corryong ..	12.30 p.m.	Driving ..	6 a.m. (10th)
Wednesday, August 10	Wodonga ..	2 p.m. ..	12.13 p.m. ..	3.5 p.m.
Wednesday, August 10	Chiltern ..	3.45 p.m.	3.45 p.m. ..	8.26 a.m. (11th)

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Monday, August 8 ..	Nagambie ..	2 p.m. ..	9.57 a.m. ..	6.57 p.m.
Tuesday, August 9 ..	Shepparton ..	10.30 a.m.	8.26 p.m. (8th)	11.45 a.m.
Tuesday, August 9 ..	Dookie ..	2 p.m. ..	12.40 p.m. ..	4.10 p.m.
Wednesday, August 10	Numurkah ..	11 a.m. ..	9.32 p.m. (9th)	12.38 p.m.
Wednesday, August 10	Cobram ..	2 p.m. ..	1.57 p.m. ..	3.10 p.m.
Wednesday, August 10	Strathmerton	3.42 p.m.	3.42 p.m. ..	4.40 p.m.
Thursday, August 11	Katamatite	11 a.m. ..	Driving ..	Driving
Thursday, August 11	Nathalia ..	2 p.m. ..	1.37 p.m. ..	3.26 p.m.
Friday, August 12 ..	Murchison ..	10 a.m. ..	7.3 p m (11th)	10.45 a.m.
Friday, August 12 ..	Rushworth	11.48 a.m.	11.48 a.m. ..	12.25 p.m.
Friday, August 12 ..	Colbinabbin	1.30 p.m.	1.20 p.m. ..	2.30 p.m.
Monday, August 8 ..	Moyhu ..	2 p.m. ..	Driving ..	Driving
Monday, August 8 ..	Whitfield ..	4 p.m. ..	Driving ..	Driving
Tuesday, August 9 ..	Wangaratta	11 a.m. ..	Driving ..	12.39 p.m.
Tuesday, August 9 ..	Bright ..	4.7 p.m. ..	4.7 p.m. ..	6.4 a.m. (10th)
Wednesday, August 10	Myrtleford ..	2 p.m. ..	7.12 a.m. ..	7.12 a.m. (11th)
Thursday, August 11	Beechworth	11 a.m. ..	9.50 a.m. ..	12.51 p.m.
Thursday, August 11	Everton ..	2 p.m. ..	1.11 p.m. ..	3.30 p.m.
Friday, August 12 ..	Euroa ..	10 a.m. ..	6.33 p.m. (11th)	11.12 a.m.
Friday, August 12 ..	Seymour ..	1 p.m. ..	12.11 p.m. ..	8.15 p.m.
Monday, August 15 ..	Beaufort ..	2 p.m. ..	12.27 p.m. ..	6.47 p.m.
Tuesday, August 16 ..	Kaniva ..	11 a.m. ..	2.28 a.m. ..	12.42 a.m. (17th)
Wednesday, August 17	Nhill ..	3 p.m. ..	1.22 a.m. ..	1.32 a.m. (18th)
Thursday, August 18	Dimboola ..	2 p.m. ..	2.13 a.m. ..	3.34 p.m.
Friday, August 19 ..	Willaura ..	11 a.m. ..	8.12 a.m. ..	2.19 p.m.
Friday, August 19 ..	Maroona ..	2.45 p.m.	2.45 p.m. ..	3.15 p.m.
Monday, August 15 ..	Pyramid ..	2.30 p.m.	2.13 p.m. ..	3.19 p.m.
Monday, August 15 ..	Mitiamo ..	4 p.m. ..	3.47 p.m. ..	8.5 a.m. (16th)
Tuesday, August 16 ..	Raywood ..	11 a.m. ..	9.18 a.m. ..	12.42 p.m.
Tuesday, August 16 ..	Tandarra ..	1 p.m. ..	12.56 p.m. ..	4.44 p.m.
Wednesday, August 17	Bendigo ..	11 a.m. ..	6.10 p.m. (16th)	12.15 p.m.
Wednesday, August 17	Marong ..	1 p.m. ..	12.44 p.m. ..	5.17 p.m.
Thursday, August 18	Maldon ..	11.30 a.m.	11.30 a.m. ..	Driving
Thursday, August 18	Shelbourne ..	1.30 p.m.	Driving ..	Driving
Thursday, August 18	Castlemaine	3.35 p.m.	3.35 p.m. ..	8.10 p.m.
Friday, August 19 ..	Newstead ..	10.30 a.m.	8.46 p.m. (18th)	11.31 a.m.
Monday, August 15 ..	Kyabram ..	2 p.m. ..	12.12 p.m. ..	4.50 p.m.
Tuesday, August 16 ..	Tatura ..	10.30 a.m.	5.33 p.m. (15th)	11.31 a.m.
Tuesday, August 16 ..	Echuca ..	1.30 p.m.	1.10 p.m. ..	3.45 p.m.
Tuesday, August 16 ..	Rochester ..	4.30 p.m.	4.25 p.m. ..	9.3 a.m. (17th)
Wednesday, August 17	Goornong ..	11 a.m. ..	10.8 a.m. ..	12.45 p.m.
Wednesday, August 17	Elmore ..	1.5 p.m. ..	1.5 p.m. ..	1.40 p.m.
Wednesday, August 17	Bamawm ..	3 p.m. ..	2.47 p.m. ..	2.47 p.m. (18th)
Thursday, August 18	Gunbower ..	4.1 p.m. ..	4.1 p.m. ..	Driving
Friday, August 19 ..	Cohuna ..	11 a.m. ..	Driving ..	12.30 p.m.
Tuesday, August 23	Rainbow ..	2 p.m. ..	9.55 p.m. (22nd)	3.10 p.m.
Tuesday, August 23	Yaapeet ..	4.5 p.m. ..	4.5 p.m. ..	5.30 p.m.
Wednesday, August 24	Jeparit ..	11 a.m. ..	8.10 p.m. (23rd)	Driving
Thursday, August 25	Lorquon ..	11 a.m. ..	Driving ..	12 noon
Thursday, August 25	Yanac ..	1.10 p.m.	1.10 p.m. ..	1.45 p.m.
Friday, August 26 ..	Ballan ..	1 p.m. ..	12.2 p.m. ..	8.26 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Monday, August 22 ..	Heathcote ..	2 p.m. ..	11.30 a.m. ..	6.23 p.m.
Tuesday, August 23	Mansfield ..	2 p.m. ..	1.50 p.m. ..	3.30 p.m.
Wednesday, August 24	Yea ..	10 a.m. ..	6.33 p.m. (23rd)	10.33 a.m.
Wednesday, August 24	Alexandra ..	2 p.m. ..	12.25 p.m. ..	4.40 p.m.
Thursday, August 25	Kilmore ..	11 a.m. ..	10.36 a.m. ..	5.20 p.m.
Monday, August 22 ..	Port Fairy ..	4 p.m. ..	3.45 p.m. ..	5.42 a.m. (23rd)
Tuesday, August 23	Koroit ..	11 a.m. ..	6.10 a.m. ..	Driving
Tuesday, August 23	Hawkesdale	2 p.m. ..	Driving ..	3.29 p.m.
Tuesday, August 23	Penshurst ..	4.13 p.m.	4.13 p.m. ..	7.31 a.m. (24th)
Wednesday, August 24	Warrnambool	10.15 a.m.	10.15 a.m. ..	10.55 a.m.
Wednesday, August 24	Terang ..	12.30 p.m.	12.5 p.m. ..	1.30 p.m.
Wednesday, August 24	Mortlake ..	2.5 p.m. ..	2.5 p.m. ..	Driving
Thursday, August 25	Camperdown	11 a.m. ..	5.13 p.m. (24th)	12.25 p.m.
Thursday, August 25	Timboon ..	2.5 p.m. ..	2.5 p.m. ..	2.45 p.m.
Thursday, August 25	Cobden ..	3.45 p.m. ..	3.45 p.m. ..	7.35 a.m. (26th)
Friday, August 26 ..	Werribee ..	2 p.m. ..	1.16 p.m. ..	6.29 p.m.
Monday, August 29 ..	Gellibrand ..	2 p.m. ..	12.54 p.m. ..	4.55 p.m.
Tuesday, August 30 ..	Beech Forest	2 p.m. ..	6.31 p.m. (29th)	3.40 p.m.
Wednesday, August 31	Laver's Hill	11 a.m. ..	5.30 p.m. (30th)	1 p.m.
Thursday, Sept. 1 ..	Colac ..	2 p.m. ..	6.16 p.m. (31st)	6.59 p.m.
Friday, Sept. 2 ..	Birregurra ..	9.30 a.m. ..	7.27 p.m. (1st) ..	10.25 a.m.
Friday, Sept. 2 ..	Dean's Marsh	1 p.m. ..	10.55 a.m. ..	2.40 p.m.
Friday, Sept. 2 ..	Winchelsea ..	4.4 p.m. ..	4.4 p.m. ..	7.52 p.m.
Monday, August 29 ..	Drysdale ..	11 a.m. ..	9.41 a.m. ..	4.6 p.m.
Tuesday, August 30 ..	Meredith ..	10 a.m. ..	9.42 a.m. ..	11.13 a.m
Tuesday, August 30 ..	Bannockburn	2 p.m. ..	11.38 a.m. ..	4.23 p.m.
Wednesday, August 31	Lismore ..	2 p.m. ..	11.55 a.m. ..	5.25 p.m.
Thursday, Sept. 1 ..	Cressy ..	10.30 a.m.	6.12 p.m. (31st)	11.5 a.m.
Thursday, Sept. 1 ..	Westmere ..	2 p.m. ..	1.17 p.m. ..	4.7 p.m.
Friday, Sept. 2 ..	Inverleigh ..	10 a.m. ..	7.29 p.m. (1st) ..	Driving
Friday, Sept. 2 ..	Geelong ..	2 p.m. ..	12.10 p.m. ..	5.55 p.m.
Monday, August 29 ..	Waubra ..	12.47 p.m.	12.47 p.m. ..	1.12 p.m.
Tuesday, August 30 ..	Skipton ..	11 a.m. ..	Driving ..	Driving
Tuesday, August 30 ..	Linton ..	1 p.m. ..	Driving ..	Driving
Tuesday, August 30 ..	Ballarat ..	4 p.m. ..	Driving ..	7.30 a.m. (31st)
Wednesday, August 31	Clunes ..	11 a.m. ..	8.54 a.m. ..	1.43 p.m.
Wednesday, August 31	Creswick ..	2.30 p.m.	2.16 p.m. ..	Driving
Wednesday, August 31	Kingston ..	4 p.m. ..	Driving ..	6.13 p.m.
Thursday, Sept. 1 ..	Daylesford ..	2 p.m. ..	7.17 p.m. (31st)	3.15 p.m.
Friday, Sept. 2 ..	Kyneton ..	11 a.m. ..	6.43 p.m. (1st)	Driving
Friday, Sept. 2 ..	Redesdale ..	3 p.m. ..	Driving ..	Driving
Monday, Sept. 5 ..	North Mirboo	2 p.m. ..	1.50 p.m. ..	4.15 p.m.
Tuesday, Sept. 6 ..	Morwell ..	11 a.m. ..	5.55 p.m. (5th)	11.57 a.m.
Tuesday, Sept. 6 ..	Traralgon ..	2 p.m. ..	12.20 p.m. ..	9.15 p.m.
Wednesday, Sept. 7 ..	Sale ..	11 a.m. ..	10.20 p.m. (6th)	1.50 p.m.
Wednesday, Sept. 7 ..	Maffra ..	4.9 p.m.	4.9 p.m. ..	11.8 a.m. (8th)
Thursday, Sept. 8 ..	Cowwarr ..	2 p.m. ..	1.15 p.m. ..	5.1 p.m.
Friday, Sept. 9 ..	Trafalgar ..	10.30 a.m.	6.51 p.m. (8th) ..	11.16 a.m.
Friday, Sept. 9 ..	Moe ..	12 noon ..	11.31 a.m. ..	6.39 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Monday, Sept. 5 ..	Bunyip ..	10 a.m. ..	9.41 a.m. ..	11.25 a.m.
Monday, Sept. 5 ..	Pakenham ..	2 p.m. ..	11.54 a.m. ..	6.2 p.m.
Tuesday, Sept. 6 ..	Neerim South	1 p.m. ..	12.20 p.m. ..	2.10 p.m.
Tuesday, Sept. 6 ..	Warragul ..	3.30 p.m.	3.25 p.m. ..	8 p.m.
Wednesday, Sept. 7 ..	Berwick ..	11 a.m. ..	8.29 p.m. (6th)	12.16 p.m.
Wednesday, Sept. 7 ..	Cranbourne	4.30 p.m.	4.25 p.m.	6.20 p.m.
Thursday, Sept. 8 ..	Woolamai ..	9.30 a.m.	7.18 a.m. ..	10.8 a.m.
Thursday, Sept. 8 ..	Dalyston ..	2 p.m. ..	10.39 a.m. ..	6.25 a.m. (9th)
Friday, Sept. 9 ..	Lang Lang	9 a.m. ..	8.37 a.m. ..	9.53 a.m.
Friday, Sept. 9 ..	Dandenong	11.30 a.m.	11.4 a.m. ..	12.39 p.m.
Monday, Sept. 5 ..	Leongatha ..	2 p.m. ..	11.4 a.m. ..	11.8 a.m. (6th)
Tuesday, Sept. 6 ..	Foster ..	1 p.m. ..	12.30 p.m. ..	2.20 p.m.
Tuesday, Sept. 6 ..	Stony Creek	3.30 p.m.	3.18 p.m. ..	11.40 a m. (7th)
Wednesday, Sept. 7 ..	Yarram ..	3 p.m. ..	2.20 p.m. ..	5.10 a.m. (8th)
Thursday, Sept. 8 ..	Welshpool ..	11 a.m. ..	5.51 a.m. ..	12.50 p.m.
Friday, Sept. 9 ..	Korumburra	2 p.m. ..	4.45 p.m. (8th)	5.5 p.m.
Monday, Sept. 12 ..	Bacchus Marsh	11 a.m. ..	9.22 a.m. ..	12.59 p.m.
Monday, Sept. 12 ..	Melton ..	2 p.m. ..	1.21 p.m. ..	8.6 p.m.
Tuesday, Sept. 13 ..	Mernda ..	11 a.m. ..	9.40 a.m. ..	1.59 p.m.
Tuesday, Sept. 13 ..	Whittlesea ..	3 p.m ..	2.25 p.m. ..	8 p.m.
Wednesday, Sept. 14	Lilydale ..	2 p.m. ..	1.53 p.m. ..	5.26 p.m.
Thursday, Sept. 15 ..	Sunbury ..	11 a.m. ..	7.44 a.m. ..	1.23 p.m.
Thursday, Sept. 15 ..	Riddell ..	2 p.m. ..	1.55 p.m. ..	9.19 a.m. (16th)
Friday, Sept. 16 ..	Romsey ..	11 a.m. ..	10.41 a.m. ..	5.25 p.m.
Monday, Sept. 12 ..	Dromana ..	1.30 p.m.	1 p.m. ..	2.20 p.m.
Tuesday, Sept. 13 ..	Cowes ..	1 p.m.		
Tuesday, Sept. 13 ..	French Island	3 p.m.		
Wednesday, Sept. 14	Hastings ..	11.37 a.m.	11.37 a.m. ..	12.52 p.m.
Wednesday, Sept. 14	Frankston ..	2 p.m. ..	1.43 p.m. ..	2.32 p.m.
Tuesday, Sept. 13 ..	Orbost ..	2 p.m. ..	8.35 p.m. (12th)	8.50 a.m. (14th)
Wednesday, Sept. 14	Nowa Nowa	10.30 a.m.	10.14 a.m. ..	Driving
Wednesday, Sept. 14	Buchan ..	3 p.m. ..	Driving	Driving
Thursday, Sept. 15 ..	Bairnsdale ..	1 p.m. ..	11.20 a.m. ..	2.25 p.m.
Thursday, Sept. 15 ..	Lindenow ..	3 p.m. ..	2.59 p.m. ..	3.1 p.m. (16th)
Saturday, Sept. 17 ..	Royal Show	1.30 p.m.		
Monday, Sept. 19 ..	,, ,,	9 a.m.		
Tuesday, Sept. 27 ..	Omeo ..	3 p.m. ..	3 p.m. ..	6.30 a.m. (28th)
Wednesday, Sept. 28	Bruthen ..	3 p.m. ..	1.30 p.m. ..	9.45 a.m. (29th)

PLANTING AND RECONSTITUTION OF VINEYARDS.

Conditions Governing the Distribution of Phylloxera-Resistant Vine Rootlings and Cuttings.

The conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings (grafted and ungrafted) from the State Vine Nursery, at Wahgunyah, have been drawn up for the current year, and copies of same are available on application.

The price at which these vines will be supplied has been recently considered by Cabinet, and the Government has decided to make an increase on last year's prices as specified below.

As regards the grafted rootlings, the increased price will only apply to the 1922 delivery. There will be no alteration for those to be delivered during the coming winter, for which contracts were entered into before 30th June last.

The increase will, however, apply to ungrafted rootlings and cuttings for delivery during the coming season.

It is felt that growers will realize that the increase is reasonable, if only on account of the higher cost of everything used in connexion with the Nursery, and the consequent increase in the expenditure necessary to continue the subsidy to the industry which is involved in the scheme for the supplying of phylloxera-resistant rootlings. Since 1914, when prices were last fixed, wages for casual labourers have increased from 7s. to 12s. per day.

Even at the increased price, vines are being supplied to intending planters at considerably below the cost of production.

In other respects, with the exception of the necessary corrections of dates (substitution of 1921 for 1920, &c.), no alterations have been made.

The time within which applications will be received remains as it was last year, as will be seen below. Applicants are required to finally decide, when filling in their application forms, as to their stock and scion requirements; no amendment can be permitted later.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated; packing extra in the case of consignments forwarded by rail:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £12 (Deposit, 30s. per 1,000).

Resistant rootlings, ungrafted, at per 1,000, £3 (Deposit, 15s. per 1,000).

Resistant cuttings, at per 1,000, £1 10s.

Application Forms.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Manager, Viticultural Station, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (pink form): (*b*) Ungrafted Rootlings and Cuttings (white form). Applications must be filled in on the proper forms, and accompanied by a deposit as specified above.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with these. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

Dates before which Applications must be made.

For Grafted Rootlings (1922 distribution, June to August inclusive), applications will be received until 30th June next. (For the 1921 distribution the time for receiving applications closed on 30th June, 1920, and present applicants cannot be supplied until 1922.)

For Ungrafted Rootlings, to be distributed from July to August, 1921, inclusive, applications will be received until 31st July, 1921.

For Cuttings (see conditions), applications will be received until 30th June, 1921.

Supplying Clean Districts.

The nurseries in which grafted rootlings are raised being situated in phylloxerated districts, *these cannot be supplied to growers in clean districts.* To do so would be manifestly unfair to owners of existing vineyards in such districts.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. Autumn ploughing may be rough, but care should be taken to plough to the trees, so that a drainage furrow is left between the rows.

Manuring.

It is just possible, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well-cultivated and thoroughly tilled land will always carry fair crops with far less manure. Further, if the orchard land is well drained, cultivated, and sub-soiled, any manures that are used will be far more beneficial to the trees. The more suitable the conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is

incalculable. Organic matter, such as stable manure, introduced into the soil quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that can be determined only by circumstances. Orchards in different climates and varying soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases, and at all times an excess beyond what is necessary for present use will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

PESTS.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin moth. All hiding places, nooks, and crannies, where the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

GENERAL WORK.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

The Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and hand weeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and if these can be kept growing much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying in immense numbers both eggs and insects that would breed and live in the ground ready to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The garden should, as well, be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

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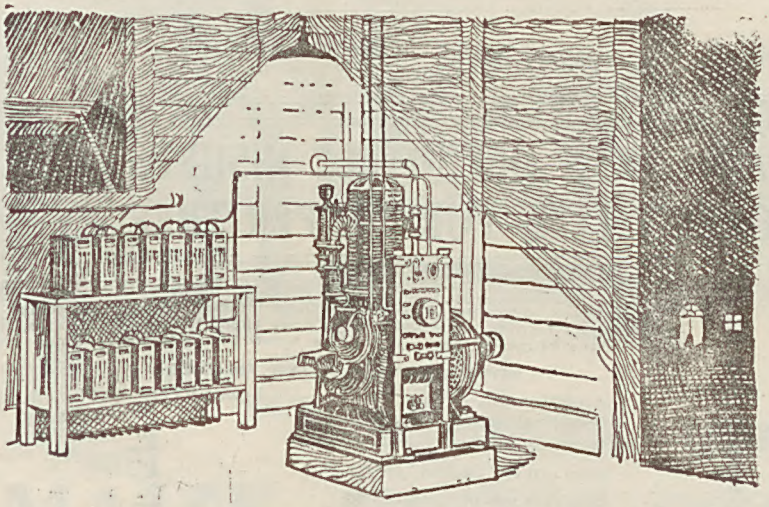

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